DOCUMENT RESUME

ED 059 367 VT 014 575

TITLE	Guide for Industrial Arts Education in California.
INSTITUTION	California Industrial Arts Curriculum Committee.; California State Dept. of Education, Sacramento.
PUB DATE	70
NOTE	46p.; 1970 Revision
AVAILABLE FROM	California State Department of Education, 721 Capitol Mall, Sacramento, California 95814 ($.40)
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	College Programs; Course Descriptions; Educational Facilities; *Educational Objectives; Elementary Grades; *Industrial Arts; Instructional Programs; *Program Descriptions; Program Guides; Secondary Grades; *State Curriculum Guides; *State Programs; Teacher Education
IDENTIFIERS	*California

ABSTRACT

This revised state guide for industrial arts was prepared to offer a framework for planning programs that could be interpreted and applied, in terms of the curriculum and facilities provided, by local district. An introduction to industrial arts education and general program descriptions are given for elementary, junior high, senior high, and college levels, including recommendations for the number and types of shops and instruction for various age levels. Characteristics discussed include: (1) instructional procedures, (2) safety, (3) organization and management, (4) guidance, (5) instructional aids, and (6) projects. A history of the nine industrial arts teacher education programs in California and a section on professional growth are included. (GEB)

ED 059367

1970 Reprint

Guide for

INDUSTRIAL ARTS EDUCATION IN CALIFORNIA

REVISED EDITION

VT014575

CALIFORNIA STATE DEPARTMENT OF EDUCATION
Max Rafferty — Superintendent of Public Instruction
Sacramento 1970

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ED 059367

Guide for

INDUSTRIAL ARTS EDUCATION IN CALIFORNIA

Revised Edition

Prepared by
CALIFORNIA INDUSTRIAL ARTS CURRICULUM COMMITTEE

FOREWORD

Industrial arts education is an integral part of the educational program in the public elementary and secondary schools of California. The increasing complexity of our modern technological society and the increasing amount of mechanization encountered in almost every phase of daily living make industrial arts experiences essential for all youth.

Educators have valued the direction and assistance provided in the *Guide for Industrial Arts Education in California,* which was prepared by the California Committee on Industrial Arts Education and published by the California State Department of Education in 1949. However, recent scientific and technological changes have made a revision of this guide necessary.

The revised *Guide for Industrial Arts Education in California,* which was prepared by the California Industrial Arts Curriculum Committee, was developed as a co-operative project by California industrial arts teachers, supervisors, and teacher educators, and the State Department of Education, and represents approved philosophy and objectives in the field of industrial arts. The guide briefly describes the elements of the industrial arts program and offers a framework that should be interpreted and applied in terms of the curriculum and facilities provided by a local school district.

All persons who have responsibility for the industrial arts programs offered in California public schools should find the revised guide of great value.

Max Rafferty

Superintendent of Public Instruction

PREFACE

A report prepared by members of the California Industrial Arts Curriculum Committee pointing out the need for the revision of the *Guide for Industrial Arts Education in California* (Bulletin of the California State Department of Education, Vol. XVIII, No. 7, September, 1949), was made during the Eighteenth Annual Conference on Industrial Education called by the Division of Instruction and the Bureau of Industrial Education of the California State Department of Education and held in Bakersfield in 1956. As a result of this report, a plan for revising the guide was agreed upon. The California Industrial Arts Curriculum Committee was assigned responsibility for preparing a preliminary draft of the material for the revision and a California Statewide Industrial Arts Committee composed of supervisors and teacher educators was named to review the material.

Industrial arts instructors from all parts of the state were also asked to appraise the material and to suggest changes or additions. All the suggestions made by the California Statewide Industrial Arts Committee and the instructors were reviewed by the California Industrial Arts Curriculum Committee and those found feasible were used in completing subsequent revisions of the material.

A detailed report of the progress made by the committees was given and a review of the material that had been prepared was made at the Nineteenth Annual Conference held in San Jose in 1957. The final report covering the material for the revised guide was submitted to the conference held in Long Beach in 1958.

The educational profession in California and particularly those members in the field of industrial arts education are greatly indebted to the California Committee on Industrial Arts Education for the original *Guide for Industrial Arts Education in California* and to the two committees who accepted a large share of the responsibility for preparing the revised guide.

Photographs used in this bulletin were contributed by Burbank Unified School District, Fresno City Unified School District, Long Beach City Unified School District, Los Angeles City School Districts, Montebello Unified School District, Richmond City Elementary School District and Richmond Union High School District, and San Diego City Unified School District, and from the offices of the county superintendents of schools of Los Angeles, Sacramento, San Bernardino, San Diego, Stanislaus, and Tulare counties. Alfred E. Bloch, Director of Arts and Applied Arts, Redwood City Elementary School District, created the cover design.

The revised *Guide for Industrial Arts Education in California* provides a sound basis for the improvement of industrial arts education in California public schools.

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Section I

INTRODUCTION TO INDUSTRIAL ARTS EDUCATION

The history of the development of industrial arts education in the public schools of California is briefly documented in the beginning of this section. An explanation of the present-day point of view or philosophy and the objectives of industrial arts education follow the introductory historical sketch. This section concludes with the presentation of information concerning terminology and definitions and the relationship of industrial arts to the total program of education.

HISTORY OF INDUSTRIAL ARTS EDUCATION IN CALIFORNIA

Certain events and movements on the national scene have greatly influenced the emergence of industrial arts education in the public schools of California. Therefore, a brief history of the industrial arts program in the United States best introduces the highlights of the beginnings and development of California's program.

In the United States before the year 1880 there were a number of experimental programs of shop work in public and private schools, but none of these developed an acceptable pattern for the public schools to follow.

At the Philadelphia Centennial Exposition in 1876, a European school exhibit attracted the attention of American educators. The exhibit consisted of a series of abstract exercise pieces in wood and metal. It was claimed that the required exercises developed accuracy, skill, and knowledge of construction. To several prominent educators this display appeared to answer the need for an organized program of shop work. Calvin M. Woodward, of Washington University, was greatly impressed, and through his influence the St. Louis Manual Training School was established in September, 1880. The school was financed entirely by private funds. This secondary school offered a sequence of courses including instrumental drawing, woodwork, patternmaking, foundry, forging, and machine shop in addition to courses in English, mathematics, science, history, and literature.

The St. Louis Manual Training School type of curriculum was widely copied. Manual training high schools supported at public expense were opened in Baltimore in 1884, and in Philadelphia and Toledo in 1885, as well as in other cities and towns across the nation. High schools bearing the names technical, polytechnic, and mechanic arts were also established. Their curricula and equipment were quite similar to the St. Louis Manual Training School pattern, although from time to time new shop areas were added to keep abreast of changing and expanding industry. Shop work became accepted as a subject field in the general high school curriculum shortly after the turn of the century.

The first real impetus to the introduction of manual training in the elementary schools came with the arrival of Gustaf Larsson in Boston in 1888, followed shortly by Charles A. Kunou and Josef Sandberg. The work of these educators was financed by private funds. Almost immediately upon arrival Larsson began teaching a private summer school class in a type of training known as Swedish sloyd and a few months later was giving instruction to public school teachers. The greatest contribution Larsson and his associates made was in the area of teacher education. The Sloyd Training School in Boston, established in 1890, gave instruction to teachers from all sections of the nation. The teachers trained in this school were responsible for the rapid growth of manual training, especially in the elementary schools. Unlike the exercise work practiced in the St. Louis Manual Training School, the sloyd system of manual training provided the student an opportunity to construct a series of useful articles, the articles being arranged in progressive order of difficulty.

After a few years of change and adjustment occasioned by the differing needs of American youth, these two European systems of instruction became a part of a uniquely American manual training program. With the change in methods of

teaching and the introduction of new shop areas, materials, and processes, the term "industrial arts" took the place of the original term "manual training." By 1930 the name "industrial arts" had gained national acceptance.

Industrial Arts on the Senior High School Level

California secondary schools were among the first to offer manual training courses. Shop courses were introduced at Boys High School in San Francisco in 1892. The student body of this school was divided in 1894 and part of it was assigned to the new Polytechnic High School. After 1900, high schools built in Long Beach, Los Angeles, Oakland, Riverside, San Diego, San Jose, Santa Monica, and in other cities carried the name "polytechnic." Course offerings in these schools represented the trades and manufacturing processes of the era and included mechanical drafting, woodworking, wood turning, forging, patternmaking, foundry, and machine shop practice in addition to the traditional courses. Courses in auto mechanics and printing appeared in the curriculum as early as 1913 with electricity being introduced a few years later. These courses, offered in the early polytechnic high schools, became the pattern for other high schools that were established later. Class sessions were one and one-half hours in length and classes met five days per week. Work completed was quite extensive and showed a high degree of craftsmanship. In the eleventh and twelfth grades, the program assumed aspects of trade training for those majoring in the field. Teachers came largely from the field of engineering and the trades, with a few men prepared by the colleges for teaching in the field of manual training.

The term "industrial arts" was adopted for use in California public schools in 1928 by a committee of supervisors and teacher educators working under the chairmanship of J. C. Beswick, who at that time was state supervisor of trade and industrial education.

With the change in name came changes in the program. Unit shops providing activities restricted to forging, foundry, patternmaking, and wood turning began to fade from the picture. Machine shop was retained in many of the older schools, but the newer schools established general metal shops incorporating the metalworking processes formerly taught in unit shops. During this period, many class sessions were shortened to one hour. By the early 1930's, the name "industrial arts" was generally applied to this program.

Early supervisors of industrial arts on the secondary school level in California school districts included Eugene Cargniglia, San Francisco; Warren Dayton, Sacramento; George Henck, Pasadena; William Mathews, Oakland; and Claude E. Nihart, Los Angeles.

Industrial Arts on the Junior High School Level

The first junior high schools, or intermediate schools as they were sometimes called, were established in Berkeley in 1909 and in Los Angeles in 1911. The industrial arts programs in these schools were patterned after the manual arts programs in the senior high schools. The shops were unit shops, as in the high schools, with similar heavy equipment. Course offerings included auto mechanics, sheet metal, printing, woodwork, and mechanical drawing. Electricity was introduced shortly afterward. The program was described as "broadening and finding." Its major aim was that of giving the pupil an opportunity to explore a variety of occupations related to the trades and industries. Pupils were given experiences in several shops.

Industrial arts became an accepted program in the junior high schools. Outstanding programs were developed in school districts in Berkeley, Long Beach, Los Angeles, Oakland, Pasadena, Sacramento, San Diego, San Francisco, San Jose, Santa Monica, and other communities. Later, certain school districts required boys to take a complete sequence of exploratory courses. These courses were offered in grades seven and eight and were usualy ten to twenty weeks in length. The remainder of the time devoted to industrial arts in the eighth grade and all of the time devoted to it in the ninth grade was set aside for students to participate in elective courses.

In 1928 changes in the course content and offerings of the junior high school industrial arts program began to take place. Gradually auto mechanics was eliminated. The sheet metal area was expanded to include several types of metal work and the term "general metal" was adopted. In the 1930's print-

ing courses began to undergo a change. In addition to hand composition and letter-press printing, many other activities were introduced into the program and it became known as graphic arts. The broadening of the bases of unit shops continued in other shop areas and the name "limited general shop" was coined to designate this new type of shop organization in the industrial arts program. Courses in handicrafts were added during this period. The broadening and expanding of the program made it possible more nearly to fulfill objectives and desired outcomes.

Industrial Arts on the Elementary School Level

The first organized program of shop work in the elementary grades in the public schools of California was established in Los Angeles in 1896. The program was under the supervision of Charles A. Kunou and was known by the Swedish name "sloyd." Shops were provided in each of the elementary schools. Teachers trained in the sloyd system were employed. Bench work in wood and simple shop drawing were taught. The program consisted of making a series of carefully graded models from the simple to the more complex. Working drawings of objects to be built were usually made before construction began.

Two early private school experiments had a marked influence upon programs in the public schools. The first was in Santa Barbara where, in 1892, Anna S. C. Blake offered school courses in sloyd with Ednah Rich, a trained teacher, in charge. The Santa Barbara City Schools co-operated fully by allowing boys to take these courses on school time. The second experiment began in 1894 at the Throop Polytechnic Institute in Pasadena, which later became California Institute of Technology. A sloyd department for elementary school children was organized at this school under the direction of Kunou. Classes in the department were used for practice teaching by prospective sloyd teachers for the elementary schools.

In the northern part of the state, San Francisco developed programs of manual training at an early date. These programs were administered by the school principals. In 1908, Frank Barthel was appointed supervisor of manual training for the San Francisco elementary schools. He served until 1916.

"Sloyd" and "manual training" were at times used as synonymous terms. However, with the broadening of the program, the name "sloyd" disappeared from use. In the manual training program, pupils were given some choice in the articles to be made. Sports projects such as kites and model boats became popular. Materials other than wood were introduced and there was a definite effort to stimulate interest in the project that was being made.

Manual training as a separate shop activity in the elementary school began to disappear with the development of the junior high school. In the 1930's an integrated activity program taught in the classroom by the classroom teacher with units of work developed for each grade level was introduced in many of the elementary schools.

POINT OF VIEW

Twentieth century America is dominated by industry. The educated man of today must be informed regarding the effect of this and all other elements of his environment. Industrial arts is that part of the total educational program which provides opportunity for the study of man and industry through participation in typical experiences in industrial processes and techniques; enriches other instructional fields such as mathematics, science, and language arts by bringing theory and practice closer together through illustrations and practical examples which are industrial in nature; and discovers and develops personal aptitudes, interests, abilities, self-reliance, good judgment, and resourcefulness through problem-solving and self expression in an environment related to industry. Industrial arts education is designed to help prepare individuals to meet the requirements of today's culture.

Today we are living in an industrial-technological-scientific culture characterized by rapid change. Most individuals are far removed from the manufacturing and processing of industrial products and therefore have little understanding of the major aspects of industry. Knowledge of the impact of the industrial revolution on society, the move-

ment of industry from home to urban centers, the development of economical interdependence, the fundamental principles of industrial processes, and the utilization of human resources are necessary if today's citizens are to live and function intelligently. Interpreting industry, discovering individual interests and abilities, and helping individuals to further their interests and to make full use of their abilities are responsibilities met through the industrial arts program—an instructional program which is an essential part of the total program of education offered by California public schools.

Industrial arts is that part of the industrial education program (industrial arts education and trade and industrial education) which contributes to the general education of all individuals. Industrial arts deals with socioeconomic problems and occupational opportunities and involves experience with a wide range of materials, tools, processes, and products. Industrial arts provides for the individual to evaluate his own interests and abilities in relation to the requirements for successful participation in industry.

Psychological implications for learning are inherent in industrial arts, in part because aesthetic, spiritual, and material needs originate in the environment, also because the activities comprising industrial arts are rooted in personal experience. The learner is goal-seeking and he learns most effectively when his learning activities are closely associated with his own goals. Teaching-learning practices, which provide opportunities for students to have personal experiences using all the senses in a manipulative way, are inherent in the content of industrial arts. Learning is considered to be a creative and individual process—one person cannot learn for another. The learning of skills, understandings, appreciations, and attitudes implies a variety of methods, techniques, and activities which involve many instructional materials. Industrial arts is a field that is rich in teaching-learning methods, techniques, and materials.

WE BELIEVE

- That education relates to the improvement of activities that are important in life.
- That every project undertaken in the school shop should be one that has definite interest and appeal to the individual or individuals involved.
- That youth come to the school shop to work. They should start work on a useful project as soon as possible.
- That industrial arts should be taught so as to present many oportunities for practical problem solving.
- That industrial arts is especially adapted to the recognition of individual differences among youth.
- That the demonstration is one of the most effective methods of teaching industrial arts. Youth are inspired to learn by the teacher-craftsman demonstration.
- That a clean, well-organized, conveniently arranged shop is an environment in which optimum learning takes place.
- That youth's participation in shop control and management is a living example of democracy at work.
- That the "guided choice" method of project selection is desirable, and that a variety of well-designed projects should be offered as suggestions of things to make. Applied creative design and planning are also an equally important aspect of the program.
- That the finished project should represent the youth's best effort.
- That manipulative skills and related technical and general information are important.
- That approximately 80 per cent of class time should be devoted to shop practice and the other 20 per cent devoted to related instruction, demonstration, class discussion, investigation, and study.
- That industrial arts is an excellent vehicle for teaching the practical application of other school subjects such as mathematics, science, and the language arts.
- That industrial arts offers a morale-building stimulus that comes through successful accomplishment.

OBJECTIVES OF INDUSTRIAL ARTS EDUCATION

To develop understanding of industry in terms of organization, raw materials, processes, products, occupations, and services.

To develop appreciation of the influence that industry has on our social and economic life; and the ability to select, care for, and use industrial products intelligently.

To develop a reasonable degree of skill in the use of tools, machines, and materials; and understanding of basic types of construction, repair, and maintenance.

To develop sound practices, attitudes, and appreciations of safety in the school shop with application to the home and everyday living.

To offer opportunities for the development of constructive leisure-time activities or hobbies requiring mental and physical activity.

To satisfy the creative desire of youth, regardless of professional or occupational interest, to construct useful articles with tools and materials.

To develop the ability to measure and calculate, and to use scientific information, graphic illustrations, and reference materials effectively in the activities.

To develop the ability to plan and work, alone and in co-operation with others, toward the orderly, efficient and complete performance of assigned and selected tasks.

To develop appreciation of good design, construction, and craftsmanship.

To discover and develop personal aptitudes, interests, abilities, self-reliance, good judgment, and resourcefulness through problem-solving and self-expression.

To enrich other instructional fields such as mathematics, science, and language arts by bringing theory and practice closer together through illustrations and practical applications.

To develop understanding of conservation and the sources of the basic materials that provide resources for man's comfort, health, and enjoyment.

To provide information and exploratory experiences in various industrial occupations and industries that will help the student to make a wise selection of his life work.

To provide opportunity for certain students to have more advanced experiences within chosen occupational areas.

Photography may be offered as a separate industrial arts area or incorporated in a related industrial arts area.

BASIC DEFINITIONS IN INDUSTRIAL ARTS EDUCATION

Industrial Arts. Industrial arts education is that part of the total program of education concerned with providing youth, regardless of occupational goals, opportunity to plan, to use tools and materials in constructing articles and performing jobs, and to develop understanding and appreciation of our modern industrial civilization.

Practical Arts. Practical arts is a type of functional education in which manipulative skills are emphasized. The practical arts include agriculture, business education, homemaking, and industrial arts.

Industrial Education. Industrial education is a generic term which includes industrial arts education and (vocational) trade and industrial education.

Curriculum. A curriculum is an organized group of courses or subjects required for graduation or the attainment of any other predetermined goal.

Course of Instruction. A course of instruction is a comprehensive statement of objectives, subject matter, methods, and materials that is designed for use in a specified course and used as a guide in teaching a given manipulative subject.

Instructional Aids. Instructional aids are types of audio and visual materials or some combination of both that are used in providing instruction, such as textbooks, reference books, films, film strips, models, displays, charts, and field trips.

Instruction Sheets. Instruction sheets are especially designed to present the user with information or step by step procedures to follow in completing a specified project or operation. There are four common types: assignment sheet, information sheet, job sheet, and operation sheet.

Project. A project is a problem solving activity which includes planning and constructing an article or the performance of a job to fulfill individual or group needs.

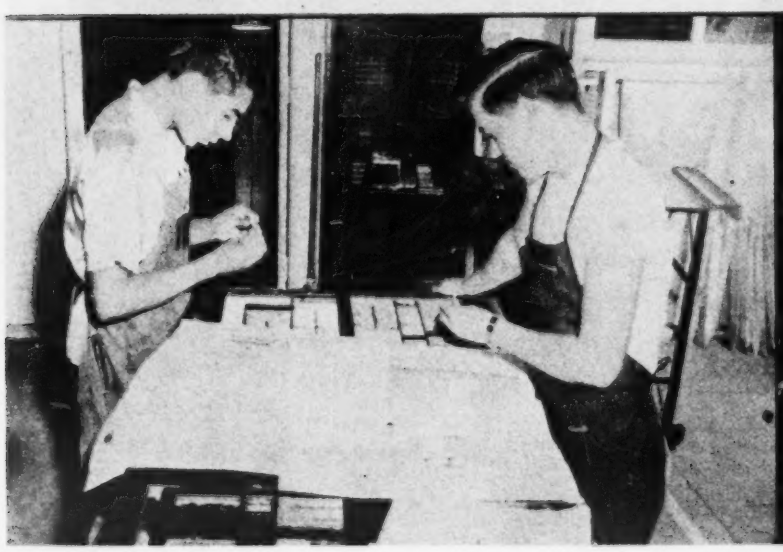
Related Technical Functional Information. Related technical functional information consists of those facts or general principles which one must know in order to plan and to do a job.

General Information. General information is that body of knowledge relating to an activity that is valuable to know but not required to complete a task or job.

Shops, Types of Organization

Comprehensive General Shop. A comprehensive general shop is one that provides facilities for a combination of student experiences in

Vocabulary of students is increased and enriched in graphic arts courses.



Students acquire ability to use acceptable drafting techniques in the production of working drawings.

two or more industrial arts subject areas, such as drafting, electricity, metal, and wood in a single shop.

Limited General Shop. A limited general shop is one that provides facilities for student experiences in a number of closely allied activities. For example, a graphic arts shop may include activities such as hand composition, press work, silk screeen process work, linoleum block printing, simple photography, and rubber stamp making.

Unit Shop. A unit shop is one that provides a single shop facility for student experiences in one area of industrial arts; for example, patternmaking shop, sheet metal shop, or welding shop.

Mobile Shop. A mobile shop is one that is built on a truck or trailer so that it can be taken to various schools. The mobile unit is equipped so that the pupils in each of the schools in the area served can be given appropriate industrial arts experiences.

RELATIONSHIPS OF INDUSTRIAL ARTS TO THE TOTAL PROGRAM OF EDUCATION

Industrial arts education has many factors in common with other subject fields, such as content, principles, academic skills, knowledges, and attitudes. The following examples list some typical relationships.

Relationship of industrial arts to *fine arts:* Students apply knowledge of materials and tool processes to design. The adapting and combining of design elements in projects is encouraged. Ability is developed to recognize and appreciate good design and construction. Opportunities are provided for creative activity. Acquired technical skills are applied to design and construction problems in the fine and dramatic arts.

Relationship of industrial arts to *health* and *recreation:* Students develop safety attitudes for home, community, and industry. Personal hygiene is practiced. Students learn to build recreational equipment. The therapeutic values of working with tools and materials as hobby and recreational activities are emphasized.

Relationship of industrial arts to *language arts:* Students utilize oral and written communication in school shop activities. Vocabulary is increased and enriched through the understanding and use of industrial terms. Special language skills are developed by writing technical reports, specifications, material orders, and by using handbooks, catalogues, books, and reference materials.

Relationship of industrial arts to *mathematics:* Students make extensive use of measuring processes. Accuracy and computational skills are developed. A wide range of experiences is provided in the use of symbols and formulas. Computations are an integral part of many processes and jobs. Concepts of tolerance are developed. Skills are acquired in the estimating and judging of size, quantity, and fit.

Relationship of industrial arts to *science:* Students are given opportunities for research, investigation, and experimentation. The scientific method is used in solving problems in the school shop. Mechanical skills are developed which are necessary in the construction of equipment for scientific experimentation.

Relationship of industrial arts to *social studies:* Students practice democracy in establishing procedures for shop management. Effective human relations are developed by student participation in shop management, by working together, and by sharing tools and facilities. Emphasis is placed on conservation when studying human and physical resources. Industrial materials and production methods are studied. A knowledge of history, geography, and economics is gained through the study of industry.

Relationship of industrial arts to *vocational education:* Students obtain information concerning requirements of occupations and discover vocational interests and aptitudes. Technical knowledge is applied to the solution of typical industrial problems. Tool and machine skills and accuracy are developed. Mass production, planning, and manufactuirng techniques are used. Advanced students have an opportunity for some concentration in an industrial occupation.

Section II

PROGRAM OF INDUSTRIAL ARTS IN CALIFORNIA

An introduction to industrial arts education on the elementary school, junior high school, high school, and college levels as well as industrial arts for special purposes is provided in the first part of this section. The overview of the total program of industrial arts is followed by a presentation of factors to be considered in planning an industrial arts program for a particular school. This unit on planning contains recommendations regarding the number and types of shops and the instruction that may be provided for different grade levels according to school enrollment.

TOTAL PROGRAM OF INDUSTRIAL ARTS EDUCATION

In the following material an overview of the total program of industrial arts education from the kindergarten through higher education is given. This material is divided into five units which briefly discuss industrial arts education on the elementary school level (kindergarten through grade six), on the junior high school level (grades seven and eight of elementary schools and grades seven, eight, and nine of junior high schools), on the high school level (four-year high schools and senior high schools), on the college level (four-year colleges and two-year junior colleges), and industrial arts education for special purposes.

Industrial Arts Education on the Elementary School Level (Kindergarten through Grade Six)

Industrial arts is an integral phase of the total program of education offered by elementary schools, for it is designed to further all the programs' objectives and to enrich the experiences pupils have in attaining the objectives. Well-planned industrial arts activities in the elementary schools, kindergarten through grade six, provide rich opportunities for pupils (1) to acquire knowledge of materials and of industrial processes; (2) to learn how to project their ideas through plans and how to use plans in completing projects; (3) to develop habits of using tools correctly and safely; (4) to become increasingly proficient workers as individuals and as members of their groups; and (5) to develop wholesome attitudes.

Industrial arts activities in the elementary schools place emphasis upon the planning and construction that is required in meeting needs that arise as pupils participate in social studies and science. Instruction is carried forward so as to strengthen pupils' interest in attaining their objectives. This is, in part, accomplished by making it possible for pupils to enjoy the satisfaction of actually producing certain of the objects which they have previously only been able to visualize. In doing the required work the pupils make practical use of certain skills they have acquired in other phases of the instructional program, acquire new skills, sharpen their ability to visualize, and in many other ways become increasingly proficient as individuals and as members of the groups to which they belong.

The classroom teacher has responsibility for conducting the elementary school industrial arts program. In assuming this responsibility, the teacher must always take pupils' interests, needs, and abilities into consideration. The teacher must then make such provisions in the program as are required by the differences that exist. These provisions will be designed to meet both individual and group requirements.

Industrial arts activities will do the following:

- Strengthen pupils understanding of social studies and science
- Enrich pupils experiences
- Encourage further study and new interests
- Create opportunity for functional use of language and arithmetic skills
- Provide opportunities for pupils to develop physical co-ordination and wholesome emotional and social growth

- Promote the safe use of tools and develop a desirable attitude toward safety in the school and home
- Offer wholesome outlets for creating and making objects
- Bring about an appreciation of the dignity of labor and the skill involved in craftsmanship
- Provide opportunities to work co-operatively

The ability to use materials well, to create with his hands, and to achieve success gives to the child a feeling of satisfaction that he may never experience in other phases of the instructional program. The personal satisfaction of work done to the best of his ability and evaluated carefully often leads to the improvement of the general work habits and standards of the individual.

Industrial Arts Education on the Junior High School Level

(Grades Seven and Eight of Elementary Schools and Grades Seven, Eight, and Nine of Junior High Schools)

Grades seven, eight, and nine form a transitional period between the elementary school and the high school. In the seventh grade the pupil encounters perhaps for the first time more than one classroom teacher. This change is an important step in the educational life of boys and girls. Industrial arts is usually offered as a separate subject in a shop taught by an instructor with specialized training.

Industrial arts is an integral part of the total educational program. The increasing complexity of our industrial economy and the increasing amount of mechanization encountered in almost every phase of our daily living make it essential that industrial arts experiences be regarded as basic and fundamental for all youth.

Pupils in the junior high school industrial arts program are guided through a series of exploratory experiences. A complete program should include industrial drawing, general wood, general metal, electricity, handicrafts, and graphic arts. In a large school each of these may be taught in separate shops. These shops are called limited general shops as they provide facilities for experiences in a number of closely allied activities in a single industrial arts subject area. For example, a limited general metal shop includes bench metal, machine shop practice, sheet metal, metal casting, art metal, welding, and forging. In schools with a small enrollment these industrial arts areas may be taught in a comprehensive general shop. A comprehensive general shop includes activities in two or more broad areas such as industrial drawing, general wood, general metal, and electricity.

Special emphasis and attention are given in grades seven, eight, and nine to helping students

Tools are easily brought to work areas within the classroom when stored in portable tool carts.

Many industrial arts activities at the elementary school level are correlated with social studies.

discover their aptitudes, abilities, and interests. This program develops manipulative skills and provides opportunity for creative activities through the construction of worth-while projects. The shop project is the vehicle for teaching the practical application of mathematics, science, social studies, language arts, and conservation. Safe practices in the use and care of supplies, tools, and equipment are emphasized. An understanding of the industrial world is developed. Abilities in performing simple home repairs and wisdom in selecting industrial products and services are stressed. Industrial arts education seeks to build a degree of proficiency in a wide variety of basic mechanical skills and provides constructive guidance in appraisal of personal abilities and aptitudes.

Two to six semesters may be used for exploratory courses. In large schools where several shops are available, opportunities should be provided for students to spend from a half semester to a full semester in each of the shops. After the student has gained a broad background in the available instructional areas he then may elect industrial arts courses that extend his experiences by gaining further skill and related information. In the small school, where a comprehensive general shop is used, a student should be given a variety of experiences in a single shop.

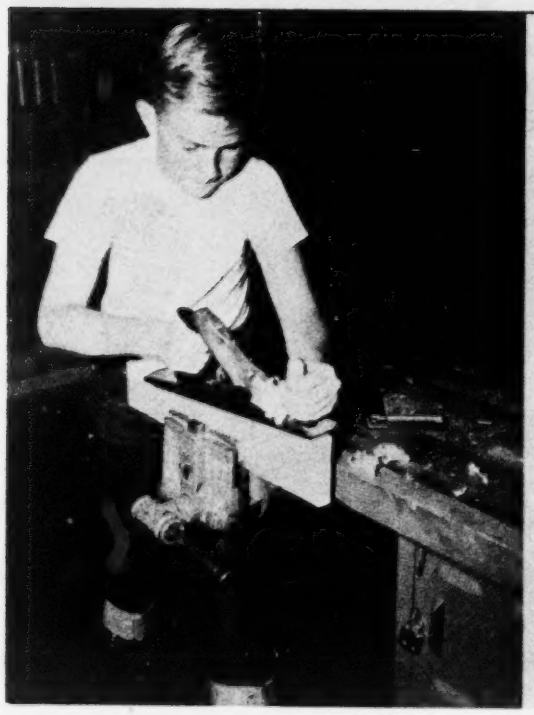
Industrial Arts Education on the High School Level

(The four-year high school and the senior high school)

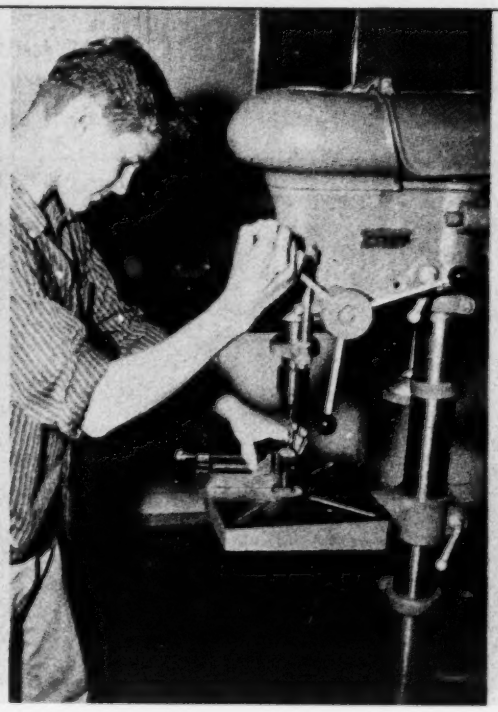
In the high schools, students have progressed to an age where they are interested in and need experiences considerably more extensive and complex than those provided in previous industrial arts classes. A high degree of accuracy and effective use of exact measurements are stimulated by the construction of more complex projects. Students in the high school industrial arts program may have completed the basic courses offered at the junior high school level. If they have not had this opportunity the senior high school program should provide for these basic courses.

All students, regardless of their occupational goal, can receive many worth-while educational experiences from industrial arts. The avocational opportunities, the construction activities necessary around the home, the consumer information about products of industry, and the skill in the use of tools and materials are all necessary.

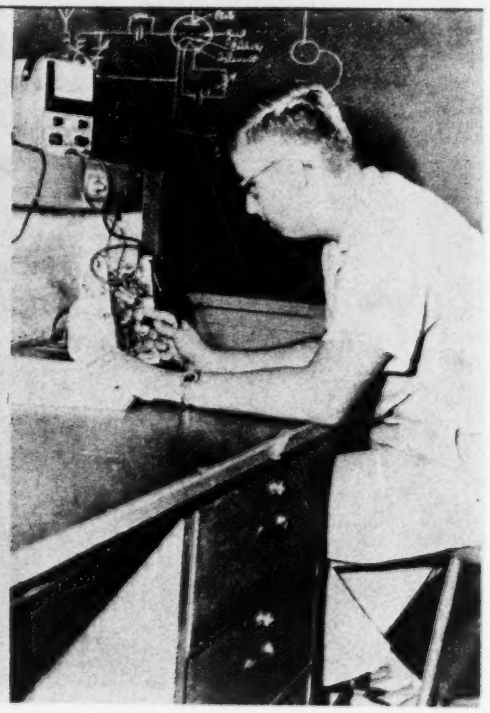
Hand tools are introduced in beginning general wood courses.

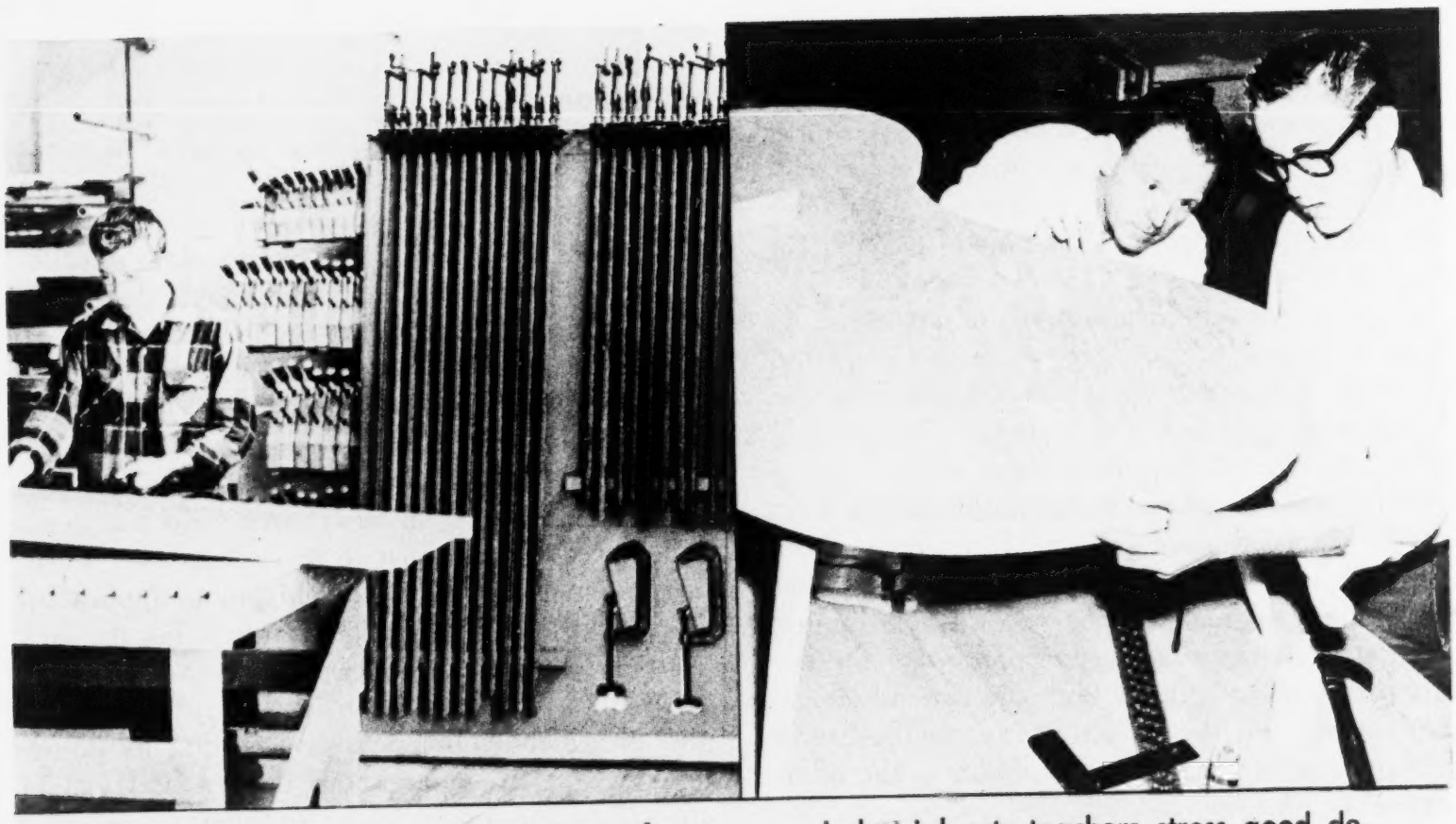


Certain power tools are provided in seventh and eighth grade courses.



Electricity courses include an application of the elements of radio.





Well-designed racks simplify storage of tools and materials.

Industrial arts teachers stress good design and craftsmanship.

In high school the student is encouraged to pursue the interests stimulated by his exploratory courses and to take further work in as many industrial arts areas as possible. In grades eleven and twelve the broad exploration of the basic industrial arts courses tends to become more concentrated in a particular area. Thus, the exploratory and occupational orientation values inherent in industrial arts become more specific in the advanced courses.

High school courses include auto mechanics, drafting, electricity-radio (electronics), graphic arts, handicrafts, general metal, photography, and general wood. In a large school, as at junior high school level, each of these areas may be taught in a separate shop called a limited general shop. In small schools a single shop called a comprehensive general shop may be used to provide a similar program.

The more advanced techniques developed in the high school shops more nearly approach the procedures used in industry. At this level more stress is given to occupational practices and information relating to the specific industrial arts subject area. In this way advanced industrial arts work is effective vocational guidance, and to some students it provides experiences necessary in a chosen occupation.

High school industrial arts offers opportunities for creative work which involves an understanding of the principles of design, an application of orderly planning, good judgment in the selection and use of materials, and skill in the use of tools and machines. The high school student is already a purchaser and is interested in specific consumer information that is inherent in the industrial arts program. Through this program the student acquires information that will make him a contributing member of our society and information necessary to recognize good craftsmanship and well-designed commercial products.

Industrial Arts Education on the College Level

(The four year college and the two year junior college)

The industrial arts program at the college level has three basic functions: (1) providing broad general education courses for all college students, (2) offering specific service courses to meet the require-

ments of other college majors and, (3) preparing industrial arts teachers. Just as industrial arts is an important part of the general education for elementary, junior and senior high school students, so is it important for college students. For many, this will be their first industrial arts experience. With this in mind, courses are offered and made available for any and all students.

Departments other than industrial arts often require industrial arts courses as part of a major. These service courses are usually requested by the department concerned for a special purpose and are set up specifically to meet these needs.

Industrial arts courses at the junior college level may be offered to meet the same functions as those included in the four-year college. The teacher preparation program will, by necessity, be limited to those activities considered appropriate for the first two years of college. Both the general education courses and the service courses of the junior college program may be quite similar to the offerings of the four-year college.

In the preparation of teachers in institutions offering teacher education, basic understandings of the philosophy and objectives of all education first must be developed. Following these basic education requirements, the future industrial arts teacher develops an appreciation and understanding of the objectives of the program by participating in industrial arts classes. Shop classes emphasize the technical skills required in teaching. These skills include the proper and safe use of hand and machine tools. Within the industrial arts curriculum, study of the industrial world as well as an understanding of the materials and processes of industry are necessary. College industrial arts departments provide and practice sound methods of teaching and effective shop organization and management. Throughout the entire teacher preparation program the professional responsibilities that are basic to education are encouraged. Good teaching is dependent upon a professional attitude and a willingness to participate in all school activities.

Industrial Arts Education for Special Purposes

Industrial arts education is concerned with general education at the elementary, junior and senior high school levels, and with general education and teacher education at the college level. However, there are a number of special programs where industrial arts may serve additional purposes

Industrial arts courses are designed to meet the different interests and aptitudes of all students. Hence, these courses provide for the individual differences of the gifted student as well as the slow learner. Gifted individuals should have educational experiences that give them insight regarding industrial progress and knowledge and skill which makes it possible for them to contribute to modern society. Opportunity should be provided for the gifted to enrich their educational experiences through participation in industrial arts classes. Gifted students who excel in manipulative as well as other learnings are in a position to make ingenious application of the skills and information acquired. For the slow learner, educational experiences become increasingly meaningful as he participates in shop activities in which emphasis is on learning by doing. Experiences in school shops deepen and extend understandings by providing for the practical application of mathematics, science, language arts, and social studies. Through participation in the industrial arts program the slow learner experiences the morale building stimulus that comes with successful accomplishment.

Adult education offers opportunities for adults to continue their education on a post high school level in basic skills desirable for adult living. The adult education program in industrial arts provides instruction in skills that will assist them in developing worth-while avocational interests, in organizing home workshops, in making useful household articles, and in discovering personal interests and aptitudes. These industrial arts courses are often similar to those offered on the high school level.

For the physically handicapped, industrial arts experiences provide practical and effective motivation as well as mental and manual therapy essential to the rehabilitation of an individual. These experiences help teachers evaluate the degree of impairment and the extent of the individual's capacity for social and economic activities.

Industrial arts activities have many recreational values which are fundamental to programs in the armed forces hobby shops, in out-of-school activities, in youth work, and for adults before and after retirement.

PLANNING AN INDUSTRIAL ARTS PROGRAM

In planning an industrial arts program for a particular school consideration should be given to the potential enrollment of the school. The number and types of shops selected should provide for present needs and future expansion. Attention should be given to the total anticipated enrollment in the shop program, the enrollment in each phase of the program, and to the needs and abilities of the students that will be enrolled in each area of the program.

Plans for the organization of industrial arts programs according to grade levels and school enrollments with recommended number and types of shops and the instruction that may be provided follow. The first organizational plan is for grades seven and eight of elementary schools and for grades seven, eight, and nine of junior high schools. The second plan is for four year and senior high schools. Each organizational plan is arranged in three columns and each column has an appropriate heading.

The enrollment figures used in column one and the number of shops recommended in column two are based on statewide average enrollments in industrial arts courses and departments in the public schools of California derived from the reports of secondary school principals, October, 1953. The types of shops and the instruction that may be provided in these facilities are consistent with the findings of surveys of present practices and standards appearing in *Suggested Courses of Instruction in Industrial Arts for the Junior High School Level, Suggested Courses of Instruction in Industrial Arts for the Senior High School Level,* and *Guide for Planning and Equipping Industrial Arts Shops in California Schools.*

The "Number and Types of Shops" listed in column two takes into consideration the long term purpose of each shop and the limitations caused by multiple use of a shop. The third column, "Areas of Instruction," lists courses and elements of courses (activities) that may be offered in the facilities proposed in column two.

PLANS OF ORGANIZATION

RECOMMENDED NUMBER AND TYPES OF INDUSTRIAL ARTS SHOPS AND THE INSTRUCTION THAT MAY BE PROVIDED FOR JUNIOR HIGH SCHOOLS AND GRADES SEVEN AND EIGHT OF ELEMENTARY SCHOOLS ACCORDING TO SCHOOL ENROLLMENT

Total School Enrollment	Number and Types of Shops	Areas of Instruction
To 250	ONE SHOP 1—*Comprehensive general*	Activities or courses: *Industrial drawing, electricity, general metal,* and *general wood.*
250-500	TWO SHOPS 1—*Metal* 2—*Wood*	Courses: *General metal* and *general wood.* (Note: Activities or courses in *industrial drawing* would be provided in the woodshop and activities or courses in *electricity* would be provided in the metal shop. *Handicraft* activities may be introduced in appropriate courses.)
500-750	THREE SHOPS 1—*Metal* 2—*Wood* 3—*Industrial drawing*	Courses: *Industrial drawing, general metal,* and *general wood.* (Note: Activities or courses in *electricity* would be provided in the metal shop. Appropriate *graphic arts* activities may be introduced to the industrial drawing courses. *Handicraft* activities may be introduced in appropriate courses.)
750-1,000	FOUR SHOPS 1—*Metal* 2—*Wood* 3—*Industrial drawing* 4—*Electricity*	Courses: *Industrial drawing, electricity, general metal,* and *general wood.* (Note: Appropriate *graphic arts* activities may be introduced in the industrial drawing courses. *Handicraft* activities may be introduced in appropriate courses.)
1,000-1,250	FIVE SHOPS 1—*Metal* 2—*Wood* 3—*Industrial drawing* 4—*Electricity* 5—*Graphic arts* or *Handicraft*	Courses: *Industrial drawing, electricity, graphic arts* or *handicrafts, general metal,* and *general wood.* (Note: If courses are provided in graphic arts, *handicraft* activities may be introduced in appropriate courses. If courses are provided in handicrafts, appropriate *graphic arts* activities may be introduced in the industrial drawing courses.)
1,250-1,500	SIX SHOPS 1—*Metal* 2—*Wood* 3—*Industrial drawing* 4—*Electricity* 5—*Graphic arts* 6—*Handicraft*	Courses: *Industrial drawing, electricity, graphic arts, handicrafts, general metal,* and *general wood.*

RECOMMENDED NUMBER AND TYPES OF INDUSTRIAL ARTS SHOPS AND THE INSTRUCTION THAT MAY BE PROVIDED FOR FOUR-YEAR AND SENIOR HIGH SCHOOLS ACCORDING TO SCHOOL ENROLLMENT

Total School Enrollment	Number and Types of Shops	Areas of Instruction
To 250	ONE SHOP 1—*Comprehensive general*	Activities or courses: *Drafting, electricity-radio (electronics), general metal,* and *general wood.*
250-500	TWO SHOPS 1—*Metal* 2—*Wood*	Courses: *Drafting, general metal,* and *general wood.* (Note: *Drafting* courses would be provided in a shop classroom, a multi-purpose classroom, or the wood shop. Activities or courses in *electricity-radio (electronics)* may be provided in the metal shop.)
500-750	THREE SHOPS 1—*Metal* 2—*Wood* 3—*Auto*	Courses: *Auto mechanics, drafting, general metal,* and *general wood.* (Note: *Drafting* courses would be provided in a shop classroom, a multi-purpose classroom, or the wood shop. Activities or courses in *electricity-radio (electronics)* may be provided in the metal shop.)
750-1,000	FOUR SHOPS 1—*Metal* 2—*Wood* 3—*Auto* 4—*Drafting*	Courses: *Auto mechanics, drafting, general metal,* and *general wood.* (Note: Activities or courses in *electricity-radio (electronics)* may be provided in the metal shop. Activities or courses in *graphic arts* may be provided in drafting room.)
1,000-1,250	FIVE SHOPS 1—*Metal* 2—*Wood* 3—*Auto* 4—*Drafting* 5—*Electricity-radio*	Courses: *Auto mechanics, drafting, electricity-radio (electronics), general metal,* and *general wood.* (Note: Activities or courses in *graphic arts* may be provided in drafting room.)
1,250-1,500	SIX SHOPS 1—*Metal* 2—*Wood* 3—*Auto* 4—*Drafting* 5—*Electricity-radio* 6—*Graphic arts*	Courses: *Auto mechanics, drafting, electricity-radio (electronics), graphic arts, general metal,* and *general wood.* (Note: Activities or courses in *photography* may be provided in the graphic arts shop.)
1,500-1,750	SEVEN SHOPS 1—*Metal* 2—*Wood* 3—*Auto* 4—*Drafting* 5—*Electricity-radio* 6—*Graphic arts* 7—*Handicraft*	Courses: *Auto mechanics, drafting, electricity-radio (electronics), graphic arts, handicrafts, general metal,* and *general wood* (Note: Activities or courses in photography may be provided in the graphic arts shop.)
1,750-2,000	EIGHT SHOPS 1—*Metal* 2—*Wood* 3—*Auto* 4—*Drafting* 5—*Electricity-radio* 6—*Graphic arts* 7—*Handicraft* 8—*Photography* or a duplication of one of the other shops.)	Courses: *Auto mechanics, drafting, electricity-radio (electronics), graphic arts, handicrafts, general metal, photography,* and *general wood.* (Note: If *photography* is provided for elsewhere in the curriculum, additional courses may be provided in any of the above areas.)

If the enrollment for a school exceeds the largest total enrollment appearing in column one of either preceding organizational plan, a duplication of shops could be made according to demand. At the high school level basic and advanced shops could be provided in areas of industrial arts where the need exists.

PATTERN OF COURSES

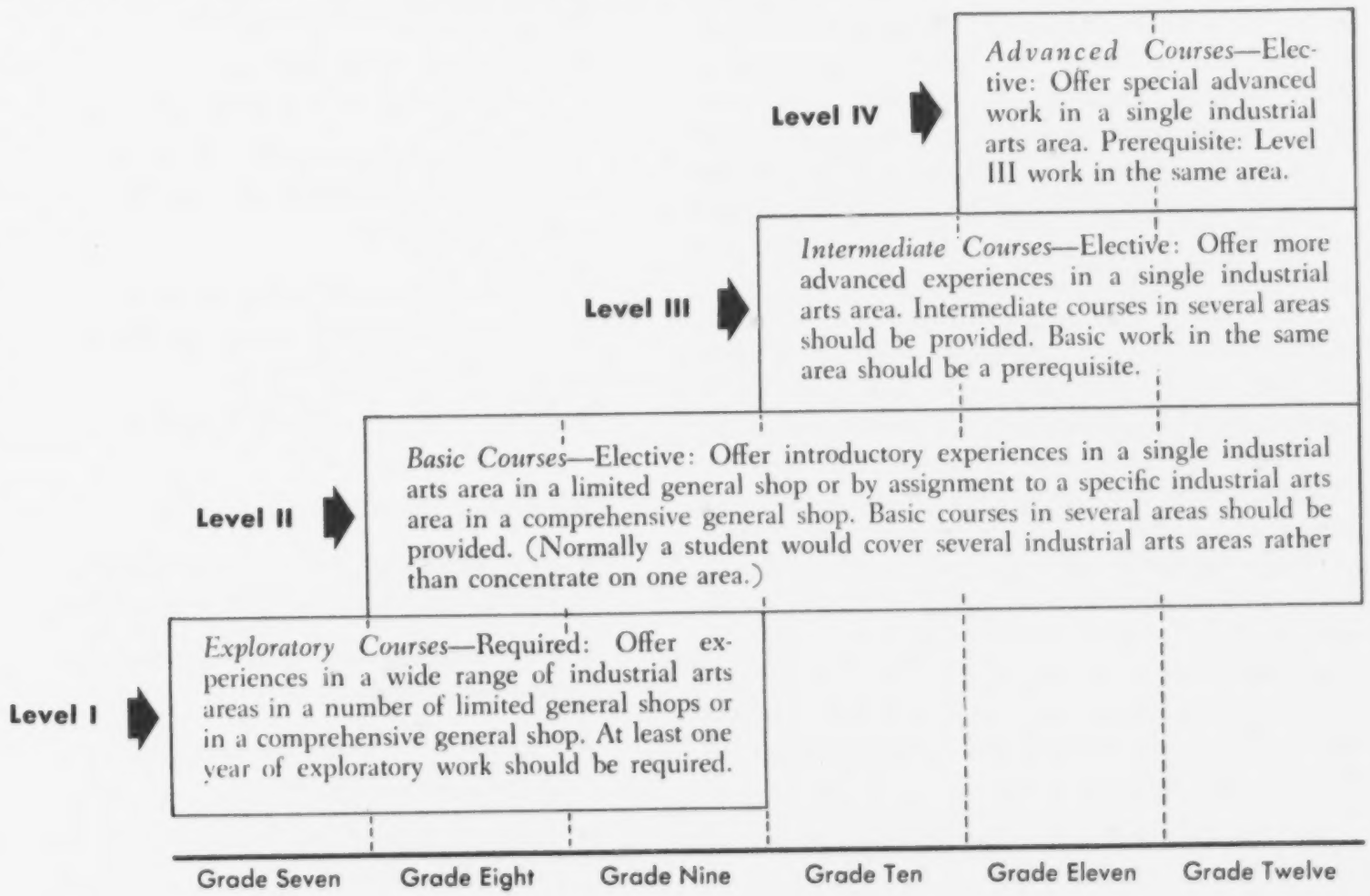
In planning a pattern of industrial arts courses for a particular school, reference should be made to the description of courses and instructional units appropriate for the grade level. Level I, II, III, IV courses are described in Section IV of this publication. Instructional units for each level appear in *Suggested Courses of Instruction in Industrial Arts for the Junior High School Level* and *Suggested Courses of Instruction in Industrial Arts for the Senior High School Level.*

Regardless of the type of school organization, a part of the following suggestions concerning industrial arts courses can be used to advantage.

In a junior high school or grades seven and eight of an elementary school two to four semesters may be used for exploratory courses. Usually, only Level I exploratory courses in industrial arts are required. In this phase of the program, a half to a full semester would be devoted to each exploratory (Level I) course. The remainder of the time devoted to industrial arts is set aside for students to participate in elective basic (Level II) courses. When a student has completed two semesters of work at Level II in a particular area of industrial arts he should enroll in a different area.

In four-year and senior high schools, Level II basic courses should be available to all students. The Level II basic courses should be available in the high school in order to enable a student who has taken no basic courses or taken basic courses in a limited number of areas to get experience in additional industrial arts subject areas. A Level II course in a particular area is prerequisite to a Level III course in the same area; likewise, a Level III course is prerequisite to a Level IV course.

SUGGESTED INDUSTRIAL ARTS COURSES FOR GRADES SEVEN THROUGH TWELVE


Level IV
Advanced Courses—Elective: Offer special advanced work in a single industrial arts area. Prerequisite: Level III work in the same area.
Level III
Intermediate Courses—Elective: Offer more advanced experiences in a single industrial arts area. Intermediate courses in several areas should be provided. Basic work in the same area should be a prerequisite.
Level II
Basic Courses—Elective: Offer introductory experiences in a single industrial arts area in a limited general shop or by assignment to a specific industrial arts area in a comprehensive general shop. Basic courses in several areas should be provided. (Normally a student would cover several industrial arts areas rather than concentrate on one area.)
Level I
Exploratory Courses—Required: Offer experiences in a wide range of industrial arts areas in a number of limited general shops or in a comprehensive general shop. At least one year of exploratory work should be required.
Grade Seven
Grade Eight
Grade Nine
Grade Ten
Grade Eleven
Grade Twelve

Section III

INDUSTRIAL ARTS IN THE ELEMENTARY SCHOOL

Industrial arts on the elementary school level is concerned with educating boys and girls to live in a technological society. Children today live in a civilization that has surrounded itself with industrial products and mechanical devices which must be understood and used. As children engage in studies and activities that help them to understand the world in which they live, they learn the social functions and human activities in which men and women engage to meet their basic needs. Elementary school industrial arts activities place emphasis on resources in man's environment and the techniques man has used to cultivate and change resources so as to increase their value to him.

Industrial arts makes a distinct contribution to the elementary school program through its own subject content, methods, and techniques. Participation in industrial arts activities helps individuals to clarify the concepts they have encountered in social studies, language arts, science, arithmetic, and other areas of learning. The interest developed while participating in the various activities in the program motivates children to acquire knowledge and skills in other instructional areas. The basic content of industrial arts relates to the highly industrial society of today. It is the comparison of the processes which man previously used in meeting his basic needs with those now being used that assists individuals to develop appreciation of man's ingenuity and "know-how" and to extend their understanding of the meaning of progress. Learning fundamental skills, participating in social studies, playing, pursuing one's interests, and exploring one's environment provide many opportunities for the use of industrial arts. It is important that children participate in industrial arts activities, for such participation carries both varied and rich rewards. Participation in industrial arts activities helps children in the following ways:

- Deepen their understanding of the content of other subject fields
- Enjoy the advantages of enrichment activities
- Develop new interests and pursue the studies required to meet their interests
- Benefit from opportunity for functional use of language and arithmetic skills
- Develop physical co-ordination and safety practices
- Work together co-operatively and grow sociably
- Experience creative outlets
- Experience emotional growth through satisfaction found in planning and creating
- Develop appreciation for the dignity of labor, the skill of craftsmen, and the problems of industrial society

The basic steps involved in a good industrial arts program conducted by a classroom teacher in an elementary school follow:

- Make a list of objectives and desirable outcomes
- Develop the plan of instruction
- Plan industrial arts activities which meet the needs and abilities of the pupil group
- Plan and assemble materials (supplies, tools, and equipment)
- Provide for the motivation of interest in the pupil group
- Schedule periods of industrial arts activities (tool identification, teacher demonstration of tool use, teacher observation of pupil activity, and direct teacher assistance on-the-spot)
- Plan activity with the class as to pupil duties during the activity period (obtaining and sharing tools and materials, working together, and cleaning up)
- Evaluate the pupils' progress in terms of industrial arts activities and pupil experiences

INDUSTRIAL ARTS IN THE PRIMARY GRADES
(Kindergarten and Grades One and Two)

Children's experiences in the area of the industrial arts begin when their awareness of the physical environment begins to develop. This usually occurs early in their lives, for both their comforts and discomforts are generally caused by their environments.

The every-day manipulative experiences of the small child form a foundation on which the primary teacher introduces manipulative experiences that are planned to help the child understand the world in which he lives. The strong individualistic tendencies of the preschool child are modified by working and sharing with other children.

The teacher plans so that the children have time for industrial arts experiences, provides for children to share activities involving industrial processes, maintains a functional work area, and helps children to learn how to use the following tools and equipment safely and correctly:

- hammer
- cross-cut panel saw
- back saw
- C-clamp
- safety block
- sawhorse
- tool cart
- miter box
- blunt scissors
- hand drill
- brace and bit
- half-round (cabinet) file
- water-base paint
- brushes
- try square
- keyhole or compass saw
- file card

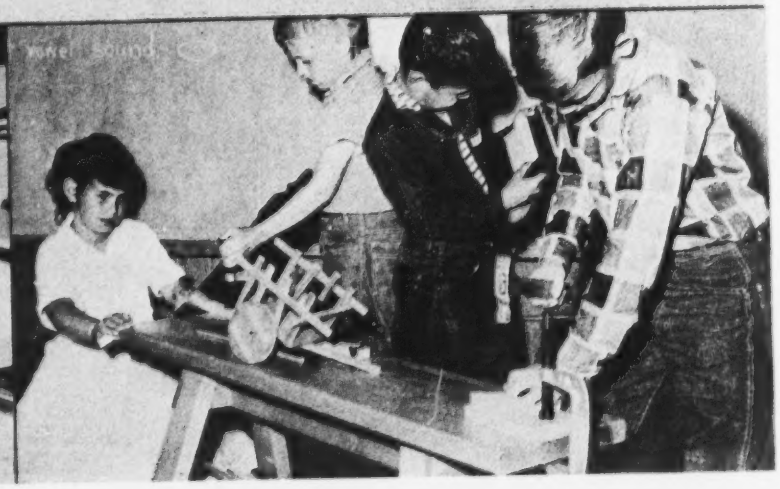
Safe practices are stressed in activities such as those that follow: clamping wood to a sawhorse, using and storing tools, keeping hands away from the cutting edges of tools, keeping the work area clean, carrying tools and materials, starting saw cuts with a safety block, and keeping tools in a safe place such as under sawhorse during construction activity.

Emphasis is placed on the importance of sharing ideas and equipment in activities of the type that follow: solving problems; planning and working with a purpose; contributing through participation in group projects; giving and accepting suggestions; thinking before doing; being self-critical; working with others as helper and leader; and cleaning up and storing tools, materials, and projects. The teacher stresses the wise use of time and materials; builds concepts of good workmanship; plans experiences that satisfy children's desire to create and manipulate tools and materials; provides applications for simple measurements; develops understanding of the importance of specialized workers in the community; and clarifies concepts of home, school, and community through industrial arts experiences.

The teacher motivates children by showing related illustrations which include slides and motion

Certain industrial arts activities in elementary schools are correlated with science.

Industrial arts experiences are a part of classroom activities in elementary schools.



pictures, reading stories, directing children's observations of objects, providing a work area with necessary tools and materials, asking appropriate questions about experiences, drawing on children's personal interests, and showing appreciation for children's efforts.

INDUSTRIAL ARTS IN THE MIDDLE GRADES
(Grades Three and Four)

Industrial arts experiences in the middle grades gradually develop children's skills and knowledge and stress the importance of working together. Children at this grade level begin to establish logical patterns of thinking, accept increasing responsibilities, learn and use social skills with increasing proficiency, expect and accept reasonable appraisal of their work, demonstrate a deepening of interests, and develop standards of workmanship commensurate with their abilities. Industrial arts experiences and understandings at this level are more meaningful when obtained through participation in the activities of a lifelike environment.

The teacher plans industrial arts activities to provide learning experiences that meet individual needs and help individuals to clarify concepts. Through participation in the activities, children learn how to use the following tools and equipment safely and correctly:

- hammer
- cross-cut panel saw
- back saw
- keyhole or compass saw
- coping saw
- C-clamp
- safety block
- sawhorse
- tool cart
- miter box
- hand drill
- brace and bit
- half-round (cabinet) file
- rattail (round) file
- triangular (slim taper) file
- file card
- try square
- ruler
- water-base paint
- brushes
- scissors
- tin snips
- side-cutting pliers
- mill file
- portable vise

Safe practices are stressed in activities such as using and storing tools, carrying tools and materials, using files, and cutting materials.

Emphasis is placed on the importance of sharing ideas and equipment; solving problems; working with a purpose; giving and accepting suggestions; being self critical; working with others as helper

Production line methods are used to further understanding of industrial techniques.

Elementary school pupils engage in construction activities.

and leader; thinking before doing; planning and working to a purpose with each child utilizing his maximum ability; contributing to the welfare of the group; evaluating individual and group effort; cleaning up and storing tools, materials, and projects. The teacher encourages children to recognize their interests, abilities, and limitations; develops an awareness of beauty and form as expressed in nature and man-made objects; and suggests industrial arts activities that create interest in exploring areas of science, solving problems in arithmetic, making simple research studies, using the language arts, and understanding the importance of industrial practices in our democracy.

The teacher develops understanding of how new products affect society; stresses the wise use of time and materials; stimulates understandings of cause and effect, social interdependence, and the dignity of labor; stresses a use of skills and resources; introduces situations requiring the practice of good citizenship skills; provides industrial arts experiences that will interpret the growth and development of the community in which the pupils live and of the state of California.

INDUSTRIAL ARTS IN THE UPPER GRADES
(Grades Five and Six)

Children at this grade level give evidence of increased interest in participating in crafts, setting personal goals, making plans, and obtaining group approval. They show ability to generalize, to think critically, and to work with the group on projects which require co-operative thought and action. At this level the teacher and the class may need to construct articles for purposes other than for furthering social studies, science, or other subject areas. For example, articles may be made for Mother's Day, Father's Day, Christmas, and for other special purposes.

The teacher, in order to develop learning experiences, plans and provides time for industrial arts experiences that meet individuals' needs and help them to clarify certain concepts, provides activities related to industrial processes, provides a functional work area, and provides opportunities for children to become increasingly proficient in using the following tools and equipment:

- hammer
- cross-cut panel saw
- back saw
- keyhole or compass saw
- coping saw
- C-clamp
- safety block
- sawhorse
- tool cart
- miter box
- hand drill
- brace and bit
- half-round (cabinet) file
- rattail (round) file
- mill file
- triangular (slim taper) file
- file card
- tin snips
- side-cutting pliers
- portable vise
- screwdriver
- block plane

Safe practices are stressed in activities such as using and storing tools, carrying tools and materials, working together in groups, and using finishing materials.

An emphasis is placed on the importance of planning and working to a purpose with maximum ability; contributing to the welfare of the group; evaluating individual and group effort; and cleaning up and storing tools, materials, and projects. The teacher emphasizes the conservation of resources in relation to the present and future economy of our nation; suggests industrial arts experiences that create interest in exploring areas of science, solving problems in arithmetic, making simple research studies, using the language arts, adopting leisure-time activities, and contributing to class and school welfare; encourages the development of a sense of pride in individual accomplishment; clarifies concepts of job needs in industry; builds understanding of the importance of having people perform work for which they are suited.

The teacher provides opportunities for pupils to participate in industrial arts activities in which they can meet their immediate intellectual, social, and emotional needs; develop awareness of utility and design; develop understanding of the efficiency of industrial practices and production; use initiative, experiment, and express creativeness; and develop appreciation of modern technology through use of new materials and processes. The teacher evaluates the accomplishment of the pupils in meeting their needs through industrial arts activities and provides industrial arts experiences that will help to interpret our nation and the importance of our neighbors in the Western Hemisphere.

Section IV

GENERAL DESCRIPTION OF COURSES ACCORDING TO LEVELS THAT MAY BE PROVIDED IN THE INDUSTRIAL ARTS PROGRAM IN GRADES SEVEN THROUGH TWELVE

This section contains general descriptions of courses for the four levels and are applicable to each area of industrial arts. These four are identified as Level I, Exploratory; Level II, Basic; Level III, Intermediate; and Level IV, Advanced. Level I and Level II courses may be provided in grades seven, eight, and nine of junior high schools and grades seven and eight of elementary schools. Basic, Level II courses along with Level III and Level IV courses may be provided in four-year and senior high schools.

Reference should be made to the suggested pattern of courses appearing in Section II of this bulletin. Additional information concerning instructional units for Levels I and II appear in *Suggested Courses of Instruction in Industrial Arts for the Junior High School Level* and for Levels III and IV in *Suggested Courses of Instruction in Industrial Arts for the Senior High School Level*. These bulletins provide the teacher with examples of typical instructional activities which may be used as a basis for the development of an industrial arts course. Certain factors that may limit the scope and pattern of courses of a particular industrial arts program are (1) the size of the school; (2) the physical facilities available; and (3) the amount of time devoted to each course.

INSTRUCTIONAL AREAS OF INDUSTRIAL ARTS AND THEIR MAJOR SUBAREAS

Auto Mechanics
: Engine, power train, chassis, electrical systems, fuel systems, body and accessories . . . . .

Drafting, Industrial Drawing
: Technical sketching; machine; architectural; furniture; sheet metal; electrical, electronic; tool design; aircraft, reproduction of drawings . . . . .

Electricity-Radio, Electronics
: Electricity, magnetism, light, heat, circuits, communications, control devices, testing, measurements . . . . .

Graphic Arts
: Photography, silk screen, block cutting, composition, presswork, binding, intaglio, thermographic printing, lithography, rubber stamp making . . . . .

Handicrafts
: Plastics, leather, ceramics, metal, lapidary, jewelry, enameling, carving, models . . . . .

Metal (General)
: Sheet metal, art metal, welding, bench metal, forging, casting, machining, heat treating . . . . .

Photography
: Camera techniques, negatives, contact and projection prints, darkroom procedures . . . . .

Wood (General)
: Bench and machine cabinetmaking, elementary carpentry, wood finishing, patternmaking, wood turning, upholstery, synthetic materials . . . . .

GENERAL DESCRIPTIONS OF COURSES ACCORDING TO LEVELS

LEVEL I, EXPLORATORY

Areas: Drawing (Industrial), Electricity, Graphic Arts, Handicrafts, Metal (General), and Wood (General)

An introduction to an instructional area of industrial arts is provided through a variety of experiences and activities. The correct and safe use of a broad variety of tools and machines is emphasized. Certain machines and operations are introduced by the instructor through the use of demonstrations. Pupils share responsibilities for the organization and management of the shop. They are oriented in the relationship of shop activities to the other subjects in the school curriculum. Attention is given to the selection, use, and manufacture of materials of industry used in the instructional program. Pupils are introduced to the importance of industry and its products as related to the home and community through pupil activities, discussions, and instructor demonstrations. Technical, general, and occupational information is provided. Interest in the instructional area is developed through projects having "boy appeal." Pupils make a number of useful articles involving a broad selection of tools, materials, and processes. Experiences in planning, designing, and drawing are an integral part of the instructional program.

LEVEL II, BASIC

Areas: Drawing (Industrial), Electricity, Graphic Arts, Handicrafts, Metal (General), and Wood (General)

The development of tool and machine skills in all major subareas of an instructional area of industrial arts and the use of materials and processes are stressed. Emphasis is placed on developing safe work habits in the shop and on the relationship of these safe practices to everyday living in school and community. Students participate actively in the operation and management of the shop. Attention is given to the development of skill, accuracy, craftsmanship, and judgment. Technical abilities and interests are discovered and occupational information is provided. Shop activities correlated with class discussions, demonstrations, and study provide for the practical application of mathematics, science, and language arts. Students have opportunity to select, design, plan, and make appropriate articles.

Wood turning is a subarea of a course in general wood.

Learning hand composition is one of the introductory graphic arts experiences.

Experiences in general metal courses develop an interest in careers as engineers, technicians, or craftsmen.

LEVEL III, INTERMEDIATE

Areas: Auto, Drafting, Electricity-Radio (Electronics), Graphic Arts, Handicrafts, Metal (General), Photography, and Wood (General)

Students acquire extensive knowledge and skills through the use of tools and machines and related information in all major subareas of an instructional area of industrial arts. Accuracy and neatness are stressed. Each subarea is specifically identified and students are encouraged to select certain subareas for emphasis. Special attention is given to the development of habits concerning safety, good working relationships, and economical use of time and material. Opportunities to participate in activities involving production methods and processes are provided. Emphasis is placed on the practical application of mathematics, science, and language arts. Occupational guidance is an integral part of the instruction offered. Students plan and design their projects, figure costs involved, and assist in ordering material.

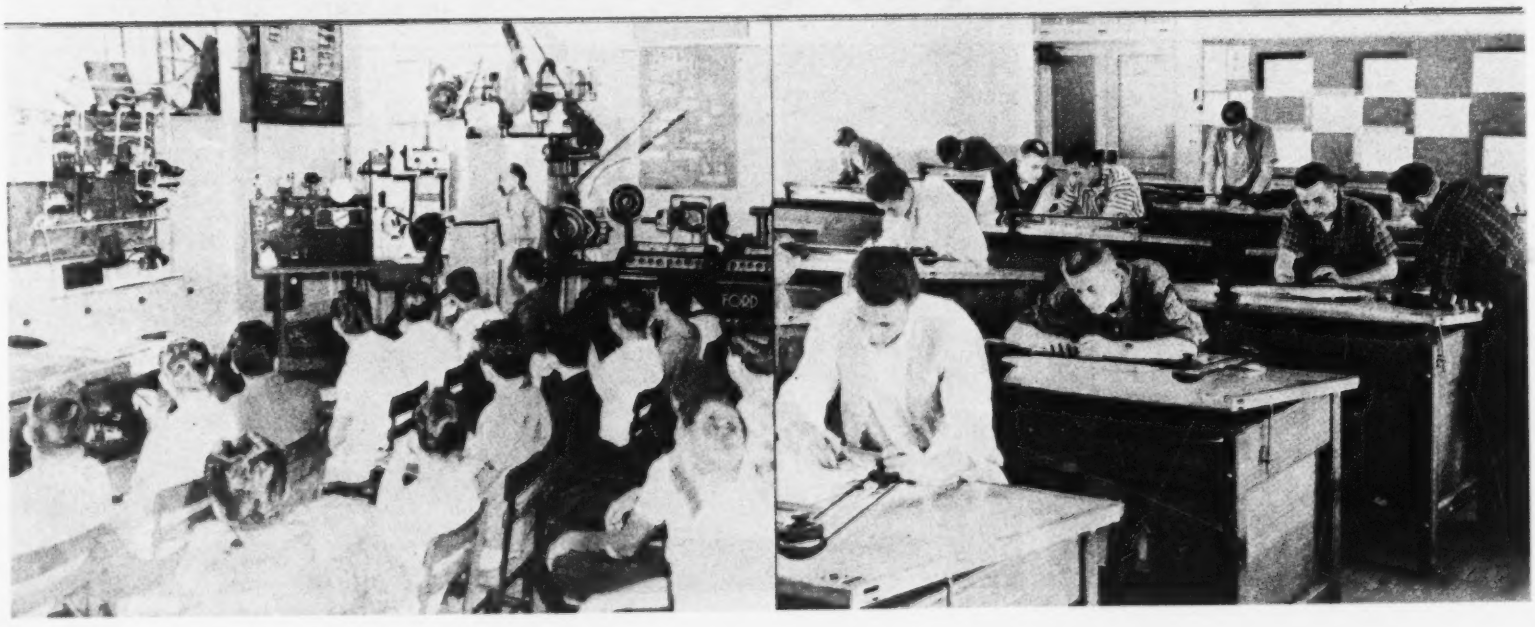
LEVEL IV, ADVANCED

Areas: Auto, Drafting, Electricity-Radio (Electronics), Graphic Arts, Handicrafts, Metal (General), Photography, and Wood (General)

Students are encouraged to concentrate in a selected subarea or subareas. Emphasis is placed on the project-problem approach in acquiring skill through the use of tools and machines and applying mathematics, science, and language arts. Instruction in using complex machines and equipment is provided. The latest industrial techniques and materials are introduced. Students are encouraged to design articles and to experiment with tools, materials, and processes of industry. Detailed information concerning the requirements of and opportunities in occupations related to the particular subareas is provided. Both individual and group projects are encouraged. The time involved in completing a job is repeatedly given attention. Methods of obtaining accuracy in quantity production are studied and used.

Instructional aids assist teachers of auto mechanics in explaining related technical information.

Industrial arts drafting courses introduce engineering and architectural practices.



Section V

CHARACTERISTICS OF AN INDUSTRIAL ARTS PROGRAM

Certain important characteristics of an industrial arts program are described in this section. These characteristics include types of instructional procedures, safety practices, organization and management methods, guidance techniques, instructional aids, and project approaches.

INSTRUCTIONAL PROCEDURES

The industrial arts shop is an activity and problem-solving center that has an environment conducive to learning and facilities for providing instruction for a variety of activities. The nature of these activities is such that various types of instruction can be used to advantage. There is unlimited opportunity for the development of individual, group, and class projects.

Good teaching depends upon the teacher knowing the experiential and educational backgrounds of each student, for it is upon the foundation laid by these that the teacher must plan to build. It also depends upon the teacher's knowledge of the point in the program at which each lesson can be best introduced and the necessary motivation secured. The skill with which the teacher builds upon the appropriate foundations and introduces lessons at appropriate points in the program is reflected by the eagerness with which students endeavor to attain the desired goals and in some measure by the success they have in attaining the goals. In preparing a lesson, the industrial arts teacher designs a plan to help students attain the desired goals. This plan provides for motivation, presentation, application, and evaluation.

In presenting a lesson the teacher follows his lesson plan and thus makes sure that his presentation is accurate and complete. He employs a variety of interesting techniques and is constantly asking questions to determine how well the students understand his presentation. He uses this information as a basis for determining wherein he must bolster the presentation and which points he will stress in summary.

Time must be allotted for students to apply what they have learned. The time required for practice that leads to mastery depends upon the student's eagerness to acquire the mastery, his background, his understanding, and his ability. The time required for mastery will be different for each student. The teacher must observe the attempts of students to apply the various aspects of the instruction and assist them as need is noted by providing additional instruction. The students should also be taught to use written instructions as supplements to the teacher's presentation. The period devoted to making application of the instruction given for a lesson is one of the most active ones for the teacher, for he must be available at all times to help each student as he encounters difficulty.

The purpose of evaluation is to improve instruction by helping both the students and the teacher to determine whether the objective of the instruction has been achieved. Making the required evaluation is a vital step in successful teaching, for not until the results are checked can either the teacher or students be certain of the extent of the students' achievements. Evaluation also informs the teacher regarding the effectiveness of his instruction.

Methods of teaching most often used by industrial arts teachers are the demonstration, project, problem solving, experiment, lecture, and shop talk.

Demonstration Method. The demonstration method consists of showing processes; the use of tools, apparatus, and materials; the application of principles of science and mechanics; and the functions of assembly or disassembly work. A successful demonstration depends to a large extent upon the student's interest in and need for the information, the teacher's skill in making the demonstration, and the environment of the instructional area.

A demonstration is given for a specific purpose at the time a certain operation or process is being discussed. And a demonstration given by the shop teacher at the appropriate time is more valuable than if the demonstration were given at a later time and in a different setting.

Project Method. The project method of teaching involves the combined use of unit organization and activity principles. In this method the situation is such that the learner needs to carry through a complete act—decide the purpose, think through the project required for the purpose, take the necessary action to complete the project, and evaluate the completed project in relation to the purpose. This method is significant to most industrial arts teachers, for its use results in the production of some object in the shop. This object is developed for a purpose and is useful in completing the project; the learner has responsibility for directing and planning his own activities and learning. The problems encountered in the course of the project development are studied and solved by the student. However, the teacher is constantly available to provide the guidance and other assistance that may be needed.

Problem Method. The industrial arts shop provides a fertile environment for the problem-solving method of teaching. The purposes of this method are fundamental to the everyday living in which each person meets and solves numerous problems. The function of problem solving in the school is to acquaint the student with the problem-solving procedures and then assist him in evaluating such procedures. In using the problem method for purposes of instruction, attention is centered on problems that are meaningful to the student. The teacher functions in an advisory capacity and as a coworker. Problem solving stimulates purposeful reflective thinking and encourages students to appraise the solutions they formulate. The three elements involved are (1) a situation which presents a problem requiring solutions; (2) a goal or end concerning some aspect of the situation for which no ready answer can be given, and (3) a desire or motive that stimulates an attempt to find the answer.

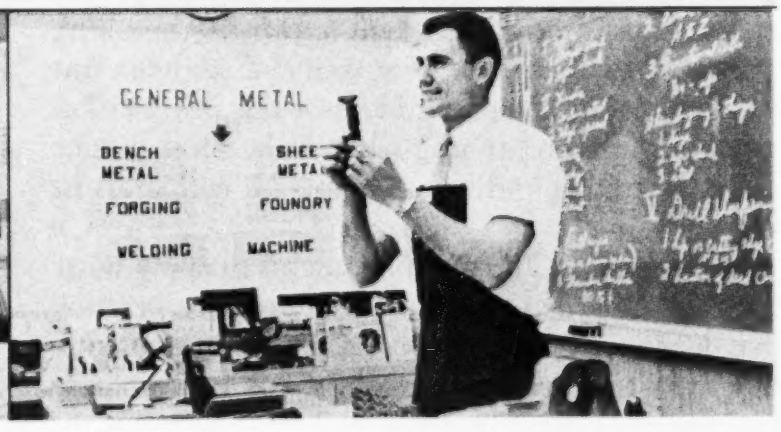
Experimental Method. The experimental method of teaching allows the student freedom to discover how and what to do for himself. Experimental learning is learning through one's own experiences. It is a form of problem solving. It is searching for facts. The experimental method is useful for students in advanced technical and mechanical work. This method is sometimes referred to as the scientific method.

Lecture Method. The lecture method may be used by the teacher in explaining a set of conditions quickly and briefly; bringing a body of facts together in a concise, well organized form; or summarizing certain findings. At the beginning of a unit or a topic it is often necessary for the teacher to give specific directions. To meet such situations, teachers find the lecture method helpful.

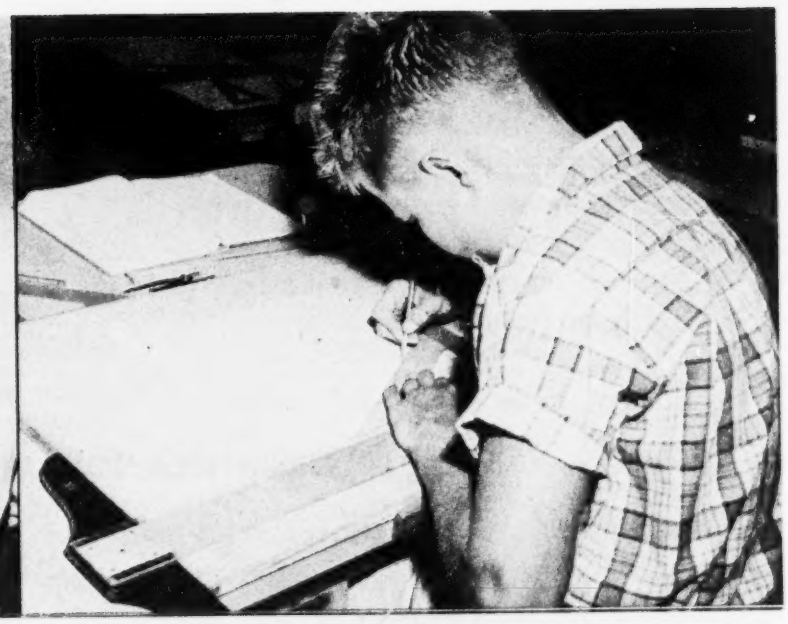
Shop Talk. The shop talk is used by industrial arts teachers as a variation of the lecture method. A shop talk should be short and especially designed to provide learners with a few key items of information or to emphasize points presented by some other method. It may be used to convey information to a number of learners at the same time. Occasionally it is a means of presenting information that is not readily available to the students through other sources. The use of this method permits the teacher to make economical use of his time.

Instructional aids play an important role in auto mechanics courses.

Teacher demonstrations introduce students to new techniques.



Architectural drawing and model making are included in drafting courses.



Courses in industrial drawing provide basic machine drawing experiences.

SAFETY

California is one of the few states in which school districts have legal responsibility for accidents that involve students while they are participating in school activities to which they have been lawfully assigned. This responsibility can be met by providing safe working conditions and instruction appropriate for the type of work that students are doing. School districts can protect themselves by carrying liability insurance. However, a school district is liable only for accidents that happen as a result of negligence on their own or their employees' part.

Industrial arts teachers are urged for the protection of their students, their own protection, and the protection of the school district for which they work to exercise every precaution to make certain that students are not involved in accidents. These precautions should include the elimination of unreasonable physical hazards and appropriate instruction in safe practices students can use in their shop activities. Industrial arts teachers may wish to carry personal liability insurance.

Two important safety factors in an industrial arts program are (1) the safe condition of the plant and equipment; and (2) the safe use of these facilities. Safe practices are emphasized through explaining and demonstrating the correct, safe procedure to follow in using tools and machines. The teacher should explain how certain safe practices of the shop relate to other daily activities of the student, both in and out of school. Instruction in industrial arts courses should unite the procedure for doing a job with the rules of safety. By the very nature of his work, the industrial arts teacher can make training in safety an integral part of every task performed under his supervision. A plan in which safety instruction is geared to the activities and the correct use of the equipment in the industrial arts shop will do the following:

- Help the student to work more efficiently
- Cause the student to become aware of safety practices that apply to his daily living in and out of school
- Aid in protecting the teacher and school district from legal actions claiming negligence
- Make it easier for the teacher to offer required instruction in accident and fire prevention

A well-planned program of safety should include safety instruction and a method of evaluating the students' understanding of this instruction. An industrial arts safety test given to all students will do the following.

- Make it possible for the teacher to evaluate his safety instruction
- Cause each student to acknowledge his understanding of the correct way to work in an environment of tools and machines
- Furnish written proof that safety instruction has been given

Information concerning safety instruction and testing may be obtained from the bulletin *Safety Instruction in Industrial Arts Education,* California State Department of Education, 1955, and from publications prepared by the offices of county superintendents of schools and local school districts. Additional information and assistance on safety may be obtained from the National Safety Council and the Office of the State Fire Marshal.

ORGANIZATION AND MANAGEMENT

The industrial arts program provides many opportunities for the use of organization and management practices. Organization of the shop is a responsibility of the teacher provided, however, that he works co-operatively with the school administration. This facet of the instructional program should include such items as the systematic planning of the physical plant for effective instruction, the selection and purchase of equipment, the development of instructional procedures, the issuance of tools and supplies, the maintenance of shop records, the operation of an adequate safety program, and the utilization of a personnel system based upon student participation. Many of the objectives of industrial arts, as stated in this bulletin, can be achieved through teacher-student participation in some type of shop organization and management.

This plan of shop organization includes the following:

- Student participation in shop management provides for the development of social skills and the understanding of democratic processes.
- A clean, well-organized, conveniently arranged shop provides an effective learning environment.
- Well-planned routine procedures within the shop require only a minimum amount of the teacher's time leaving a maximum amount of his time for instruction.
- A well-organized instructional program provides an adequate amount of shop activity as well as related information and class discussion.

Shop safety is a part of the student personnel system. The conduct of the shop safety program through the student personnel system and its integration in all shop activities provide for student participation. The safety program should be outlined and put into action on the first day of school.

The teacher should have his program well organized and planned prior to the first day of class with equipment, tools, and supplies ready for immediate use. The tools should be arranged in a neat, orderly manner in a convenient location within the working area. They should be placed so that missing tools can be readily detected. Provision should be made for a different student to check the tools at the beginning and end of each period and to report his findings to the teacher. Projects and supplies should be stored to provide for easy access, checking, and distribution.

Good shop management in industrial arts involves student participation in the control of the school shop. The three main purposes of shop management are to (1) train the student for leadership and followership; (2) provide students with an opportunity to explore industrial procedures; and (3) relieve the teacher of routine duties.

The personnel system must be organized so that it provides opportunity for every member of the class to participate. Each student must sense that the plan has a purpose and that he is important to its proper function.

There are many systems for the assignment of student personnel and it is imperative that the one selected be appropriate to the situation. Each assignment must be specific and planned to provide a certain learning experience. These assignments for personnel should be posted.

Chart indicates shop clean up assignments by bench rows.

A large model of a hammer with a handle containing slip blocks is used to designate student responsibilities.

A section of a job assignment device containing names of students is changed each period.

The student personnel system of shop management should involve job assignments that are rotated whenever the educational possibilities diminish. Typical responsibilities in which students may assist the teacher follow:

- Conducting the shop organization
- Checking tools at the beginning and end of each class
- Inspecting work stations for orderliness
- Issuing supplies during the class period
- Operating the safety program
- Checking finishing areas for orderliness
- Conducting the shop library
- Serving on clean-up detail

GUIDANCE

The industrial arts program is planned so that students are constantly being helped to make the adjustments required by their growth and development. Students are encouraged to share and to work together. Moral and spiritual values are emphasized in establishing desirable goals and in the development of character and personality. The industrial arts program involves working with the individual. The teacher thus becomes particularly important in the growth and development of the adolescent boy. The shop offers a suitable environment for the development of the attitude known as "man to man."

In addition to the guidance responsibilities that the industrial arts teacher has in common with every classroom teacher, he has the added responsibility for the technical and specialized counseling of students and interpreting industry for teachers, administrators, counselors, and students.

The industrial arts teacher has responsibility of helping students to discover their interests, determine their abilities, and obtain reliable educational and vocational information. In junior high schools and in grades 7 and 8 of elementary schools, an exploratory sequence of industrial arts experiences provides students with a wide range of activities in working with tools, materials, and processes. Through participation in this type of program interests, abilities, and aptitudes are discovered. These interests, abilities, and aptitudes are further developed in the elective courses offered in the secondary schools. Advanced students in the high

school industrial arts program are permitted to concentrate in a selected area or areas. As students develop definite career interests in a specific area, the industrial arts teacher helps direct them toward acquiring manipulative skills, technical knowledge, and information concerning occupational requirements.

It is particularly important that the industrial arts teacher alert students to the need for matching their abilities to the various levels of career opportunities. Students should learn about job opportunities, job security, and training needs for the semiskilled operator, skilled journeyman-craftsman, technician, as well as semiprofessional and professional persons. Teachers should guide students so that those with special abilities and interests in the field of industrial arts might become industrial arts teachers.

Every industrial arts teacher should be acquainted with the (vocational) trade and industrial education program and be prepared to offer guidance to students concerning trade preparation. He should also be familiar with the apprenticeship program and with the basic laws applying to apprenticeship.

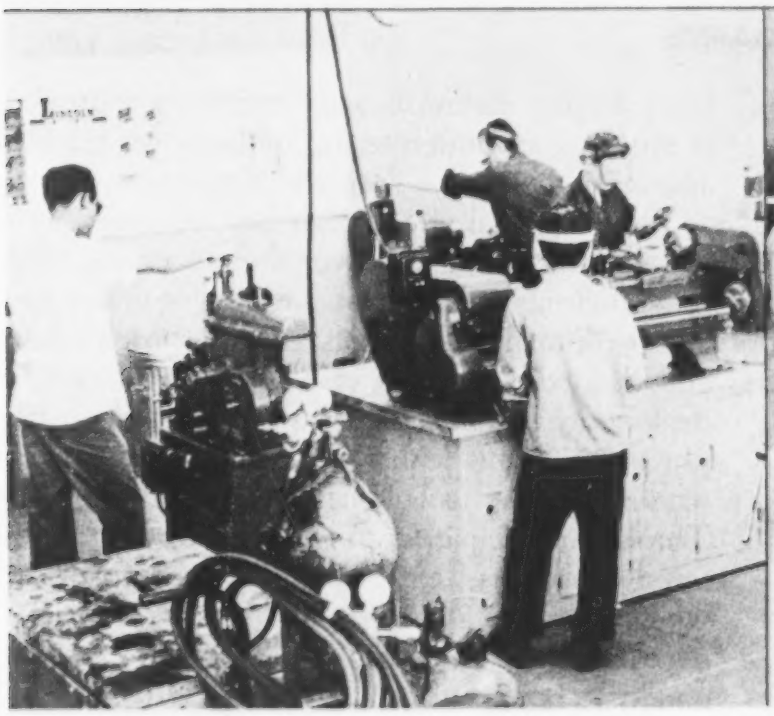
The industrial arts teacher should be acquainted with the entrance requirements and with the scope of the junior college program. He should know that state colleges and universities have recognized the value of industrial arts education at the secondary level as a prerequisite to professional education on the college level by requiring or recommending certain industrial arts courses.

The industrial arts teacher should point out to students that experiences in industrial arts provide a foundation for managerial and proprietorship careers.

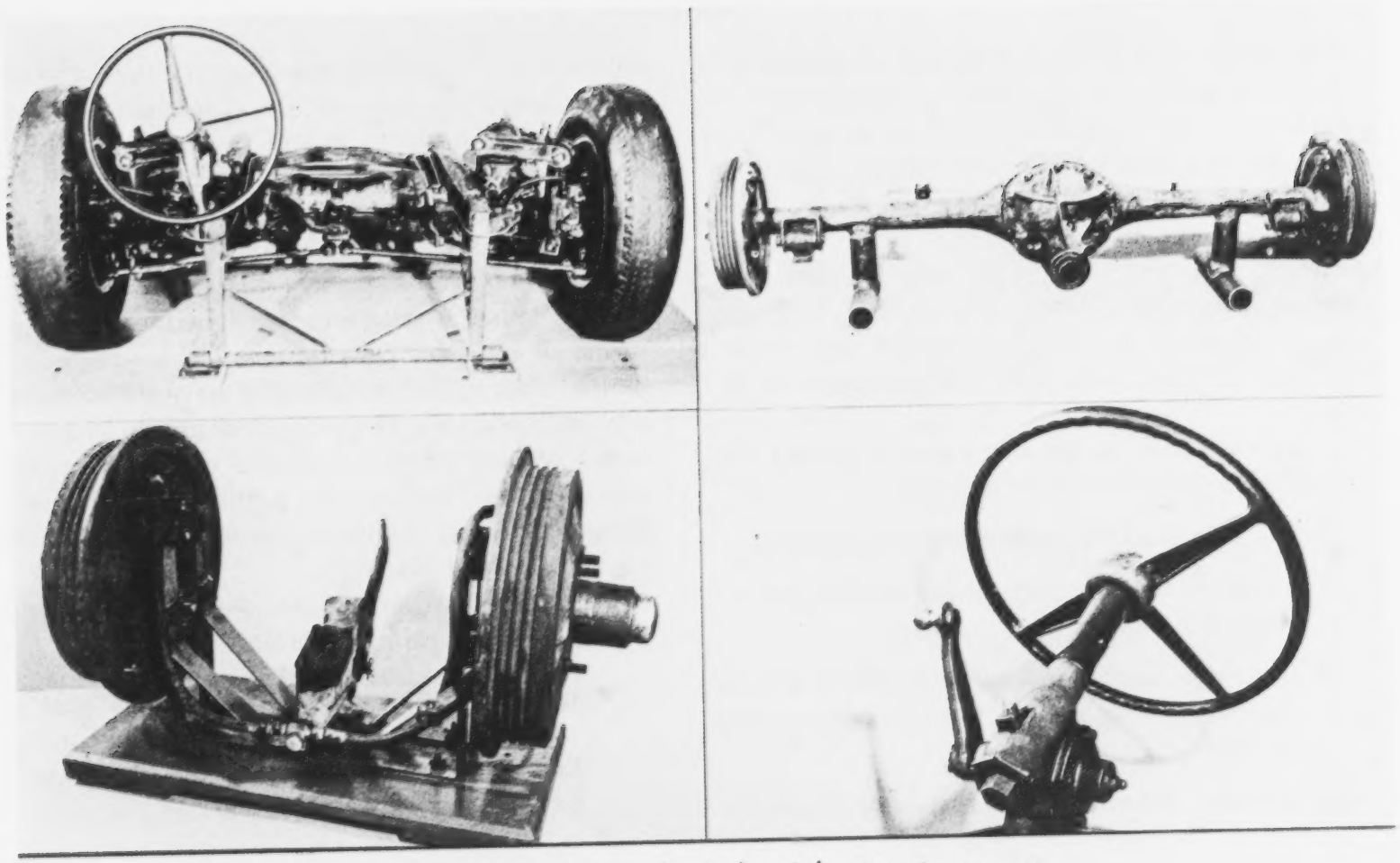
Each industrial arts teacher must familiarize himself with the standard tests of aptitude, intelligence, and personality. On many school staffs, the industrial arts teacher can offer additional service by qualifying to administer specialized tests for determining mechanical aptitudes, finger dexterity, and spatial relationship.

Specific guidance should be given students for whom the high school is terminal education to help them secure jobs in which they will succeed because of their interests and abilities. Industrial arts teachers in California public high schools need to offer specific information on the "how" and "where" of finding a job. Industrial arts teachers should provide counselors with specialized help in all phases of occupational guidance for terminal students.

A course in general metal includes machine shop practice.



Students engage in a broad variety of activities in graphic arts courses.



Instructional aids used in industrial arts auto courses

INSTRUCTIONAL AIDS

Instructional aids assist in clarifying concepts, enriching understandings, and motivating learning. Their use, however, must be planned if the best results are to be obtained.

Industrial arts teachers utilize instructional aids to secure motivation and to further and deepen students' understandings. These aids are usually grouped for use according to whether they stimulate perception through the ear, the eye, or a combination of both. Radio, transcriptions, and recordings are instructional aids that have auditory impact. Charts, drawings, bulletin board displays, and books have eye appeal. Sound motion pictures, field trips, and teacher demonstrations are teaching devices which further students' understandings through audio-visual perception. Visual instructional aids include motion pictures (silent), film strips (silent), slides, pictures, charts, diagrams, blueprints and drawings, samples and objects, models, cutaways, mockups, bulletin board displays, exhibits and displays, procedure boards, textbooks, reference books, catalogues, pamphlets, and instruction sheets (job sheets, operation sheets, information sheets, and assignment sheets).

Motion pictures (sound), filmstrips (sound), field trips, demonstrations, chalkboard presentations, and flannel board presentations may be used in the instruction as means of getting students to utilize all their senses whenever the learning situation permits.

Skillful demonstration of processes, operations, and tool techniques have long been recognized as some of the best instructional aids. Good industrial arts teachers have also utilized along with their shop talks the chalkboard, flannel board, and other devices to make certain points clear and understandable. The use of instructional aids provides the motivation to learning that is usually missing when the teacher-lecture method is employed as the method of presentation.

PROJECTS

The term "project" has different meanings depending upon the subject field and grade level in which it is used. In industrial arts, projects include the work of planning and constructing objects or that of performing jobs in the school shops. They are the vehicles of learning that involve experimenting, planning, designing, and problem solving; applying mathematics, science, and language arts; using hand and machine skills; and understanding of tools, materials, and processes of industry.

In the selection and evaluation of a project the following criteria should be applied:

- Meets individual student interest and need
- Lends itself to the attainment of accepted industrial arts objectives
- Introduces to the student new skills and processes and gives an opportunity to review those previously acquired
- Requires material which is reasonable in cost when compared with the value of the completed object
- Is properly designed and constructed for functional use
- Presents a problem for the student that is within his ability to solve

Projects in industrial arts are usually (1) required and assigned by the teacher; (2) selected by the students on a limited choice basis; or (3) selected by the students on a guided choice basis.

The practice of having required projects for all students is most commonly employed in beginning classes where students learn basic operations and processes. Once students know these, the most common practice is to permit students to select their projects from a limited number of projects that have common elements or on a guided choice basis from a wider number of projects. Such free choice usually results in students being vitally interested in completing the projects they choose. Regardless of the basis used to determine students' projects, the students should proceed logically in planning their projects, in constructing the objects involved, and in evaluating the effectiveness with which the project is completed.

Designing is an important phase of the planning process. Where the project is assigned, the problem is one of reproducing a design. Where there is a limited choice, the student may have the opportunity of modifying the design to suit his likes or needs. Where there is a guided choice of project selection, the student may duplicate or modify a design or he may originate a design. This is according to industrial practice.

Suggestions regarding the steps that students should take in completing projects follow:

- Discuss the project selected with his parents and his instructor, this discussion to include items such as the object's utility, design, material, and cost.
- Do elementary research regarding design and materials in books, magazines, and catalogues found in the school shop and in the library. Visit stores and shops where he may pick up suggestions for design, materials, and construction.
- Make a sketch followed by a working drawing complete with dimensions and all necessary details.
- Check off the stock bill from his drawing, order and figure the cost of material needed, and lay out full size all parts.
- Construct the project.
- Evaluate the completed project co-operatively with his instructor. This evaluation is of both the procedures and product. Consideration is given to the design, proportions, construction, and finish of the object constructed.

Section VI

PROFESSIONAL GROWTH

Professional growth, for purposes of education, is the progressive development of an individual or a group in the teaching profession.

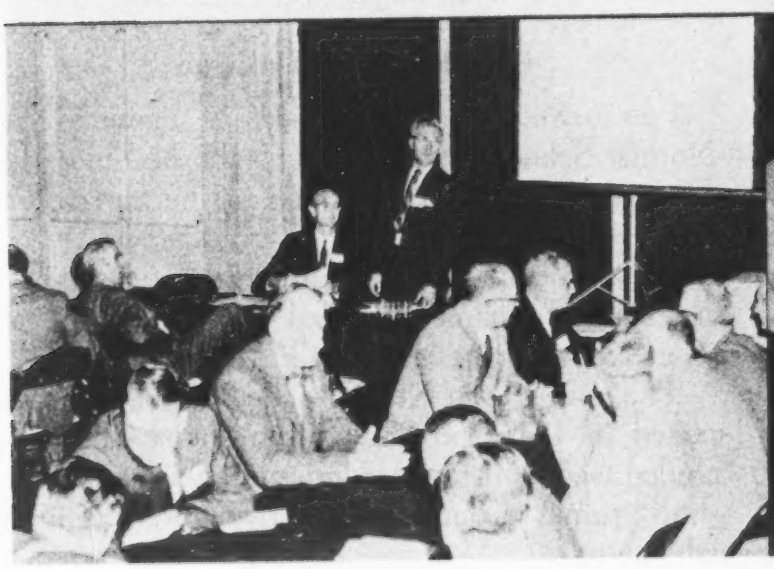
Professional growth is more than the mere upgrading of the profession. It is an attitude of its members regarding their opportunity to contribute to the over-all status of the profession. Professional growth involves the critical and introspective attitude of the individual teacher toward self-improvement. It is a concern of the individual for group growth, morale, and discipline; and conversely it is the group's concern for the individual's growth, morale, and discipline.

It is the responsibility of the profession to assure that its members gain and retain a desirable attitude toward continuous growth and development of individuals in the profession.

Industrial arts educators are motivated into growth activities by either internal or external forces. The desire within an individual to grow is an internal force, while the external forces are provided by others, especially members of the profession. Reflective and creative thinking and self-evaluation are of vital importance in the development of an effective personal plan to give direction and purpose to the life and career of an individual. People are stimulated into professional growth activities by such factors as personal satisfaction and job happiness, better status, acceptance as a member of the group, greater teaching effectiveness, salary increases, and promotions.

A competent industrial arts teacher finds that he grows professionally by participating in various activities. These activities can be called in-service education which includes all activities engaged in by a professional person during his service and designed to contribute to his improvement on the job. Typical activities which may result in professional growth are attendance and participation in conferences and conventions, institutes, and workshops; membership and participation in professional organizations; enrollment in advanced studies; participation in school and community activities; and contributions to professional publications. Other activities that may result in professional growth include reading professional literature in the fields of education and industrial arts, participating in research and in work experiences, and traveling.

Industrial arts supervisors and teacher educators participate in a conference.



Elementary school teachers take part in an industrial arts workshop.

Section VII

INDUSTRIAL ARTS TEACHER EDUCATION IN CALIFORNIA

A brief history of the nine institutions of higher learning in California with departments for industrial arts teacher preparation which have been accredited for credentialing purposes by the California State Department of Education appears in this section. These historical sketches are followed by information concerning the general requirements for teaching industrial arts in California and methods for securing teaching credentials.

HISTORY OF INDUSTRIAL ARTS TEACHER EDUCATION IN CALIFORNIA

At present nine institutions of higher learning in California have departments for industrial arts teacher preparation which have been accredited for credentialing purposes by the California State Department of Education. The name of each of these institutions and the date its department was accredited follow: University of California, Santa Barbara College, January, 1923; San Jose State College, April, 1925; Chico State College, October, 1926; Fresno State College, June, 1948; Pacific Union College, June, 1951; Long Beach State College, June, 1954; San Diego State College, June, 1954; San Francisco State College, June, 1954; and Los Angeles State College, June, 1955.

The following historical sketches are confined to present accredited industrial arts departments in California institutions of higher learning.

Chico State College

Chico State College introduced industrial arts in 1902 as the Department of Art and Manual Training with three courses taught by Annie Swain. The College was then known as the Chico Normal School. The succeeding supervisors of manual training were Clara M. Hetschel from 1906 to 1918, Eva Ealand from 1918 to 1922, and Carl J. Schreiter from 1922 to 1926. In 1926 David F. Jackey, later dean of the Division of Applied Arts at the University of California, Los Angeles, was appointed head of the department, which then occupied a new building. Under the leadership of Jackey, the program was changed to industrial arts education.

Russell B. Kidder was appointed as head of the department in 1931. During the next twenty years Kidder was instrumental in the further development of an industrial arts program which offered leadership within the college's area of service. Einar E. Siro was named co-ordinator of industrial arts in 1950 and was followed in that position by Glenn S. Duncan in 1956.

The department was accredited to offer the Bachelor of Arts Degree with a Special Secondary Credential in Industrial Arts in October of 1926. In addition, courses are provided for a General Secondary Credential and a Master of Arts Degree in Industrial Arts. The department is affiliated with the Applied Arts and Science Division, which includes the Departments of Agriculture and Engineering. Course offerings have grown to 59 undergraduate courses and seven graduate courses. Service courses for the science department and elementary teacher education are also provided. The staff has grown to include nine full-time instructors. Additional facilities were provided in July, 1957, for auto mechanics, graphic arts, machine shop, general metal, and electricity-radio.

Fresno State College

Fresno State College carried the name Fresno Normal School, when it was established in 1911. Manual training was included in the curriculum under the direction and instruction of W. B. Givens. From 1914 to 1915 the primary handwork courses were named manual training, while all other courses were called industrial arts.

The new Fresno Normal School buildings, completed in 1916, provided seven shops which included wood, art metal, forging, drawing, machine shop, primary handwork, and manual training laboratory.

Lynne E. Stockwell was appointed head of the department in 1926. A new plan, whereby the college students enrolled in indusrial arts courses were assigned to the city schools for their laboratory work, eliminated most of the shop work at the college.

Marion A. Grosse, who was assigned as a part-time instructor in 1936, became head of the Industrial Arts Department in 1941. Under the leadership of Grosse, plans were developed for a new industrial arts building for the new college campus. The dream of many years became a reality in 1953 when the Department of Industrial Arts moved into its new building on the new Shaw Avenue campus.

During the past twenty years the Department of Industrial Arts has come a long way from one shop and a part-time instructor to a fully-equipped building with twelve shops plus a staff of twelve full-time and three part-time instructors. The department was accredited to offer the Bachelor of Arts Degree with a Special Secondary Credential in Industrial Arts in 1948. In addition, courses are offered for a General Secondary and Master of Arts Degree. The Industrial Arts Department is in the Division of Applied Arts, which includes Home Economics.

Long Beach State College

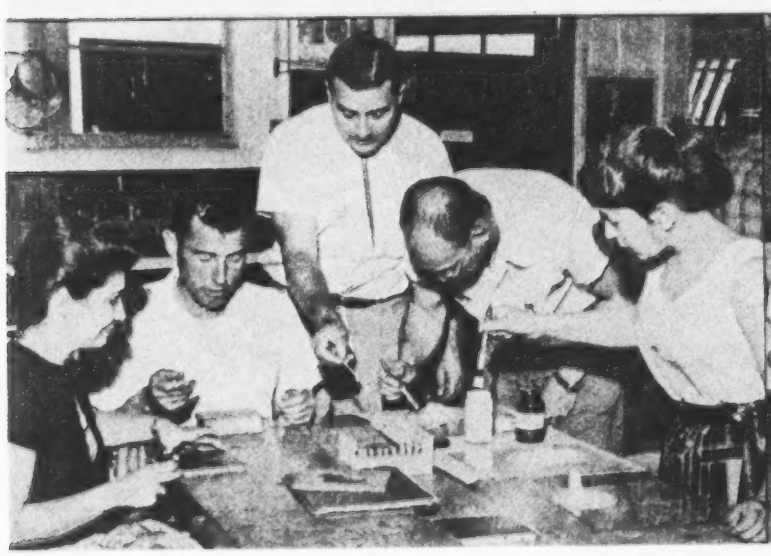
Long Beach State College's earliest plans included a curriculum in industrial arts. This was implemented in 1949 when William MacQuarrie joined the staff and organized the first program. The first classes were offered in 1950-51 with the Long Beach Unified School District providing the shop facilities. The first shop facilities on the college campus, consisting of a general woodworking shop, a general metalworking shop, and an industrial drawing room, were placed in operation during the 1952-53 school year. At that time the department consisted of two staff members and seven full-time majors.

After the death of MacQuarrie in November, 1952, C. Thomas Dean assumed the responsibility for developing the new program. Since that time additional shop facilities have been added and the physical plant developed to include the areas of woodworking, general metalworking, machine shop, radio-electronics, automotive, industrial drawing, handicrafts, elementary industrial arts, and graphic arts.

The department was fully accredited in June, 1954, and authorized to recommend for the Special Secondary Credential in Industrial Arts. During the same year the department was authorized to grant the Master of Arts Degree in Industrial Arts and to offer courses leading to a General Secondary Credential with a major in Industrial Arts.

During the period 1954 to 1957 the Industrial Arts Department grew to where it was one of the largest in the country. The staff had been increased to 14 full-time and several part-time instructors.

Future elementary school teachers engage in industrial arts activities.



College majors in industrial arts education discuss a problem in composition.

The department had increased to approximately 300 majors and 125 graduate students.

Funds for the first permanent industrial arts building were provided in the 1958 College budget. The new building will have adequate facilities for the expanding program.

Los Angeles State College

Los Angeles State College established an industrial arts department in September, 1953. Supervisors responsible for industrial arts education in the school districts within the service area of the college were appointed to an advisory committee to assist this teacher preparation program.

Claude E. Nihart, who had devoted many years to the development of the industrial arts program in the Los Angeles City School Districts, was appointed head of the new college department.

Los Angeles State College was first located on the campus of Los Angeles City College and offered college courses for only the junior and senior years. The Industrial Arts Department provided courses in electricity, graphic arts, handicraft, general metal, general wood, and machine and architectural drawing.

Achievements of the Industrial Arts Department include accreditation of the department by the State Department of Education in June, 1955, and approval, in the same year, by the Graduate Study Committee of the curriculum leading to a Master of Arts Degree in Secondary Teaching with emphasis on Industrial Arts.

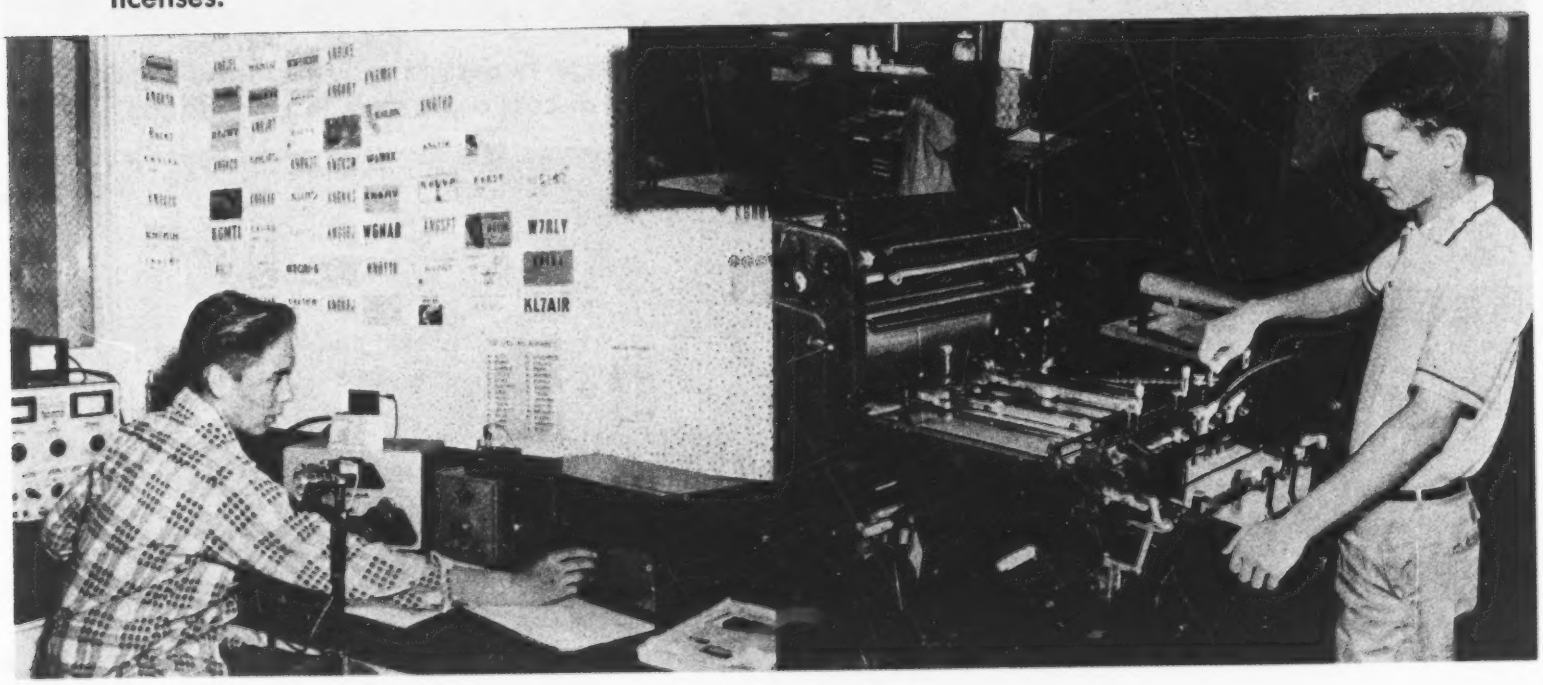
The department began in September, 1953, with 16 students and one full-time and two part-time faculty members. Three years later, in September of 1956, the student enrollment in the department had increased to 125 majors, 12 minors, 25 graduate students, and a faculty of four full-time and three part-time members. Upon the retirement of Nihart in June, 1956, Clifford G. Dobson was named head of the department. In September, 1958, the Industrial Arts Department moved to its new building on the new Ramona Campus of Los Angeles State Colloge.

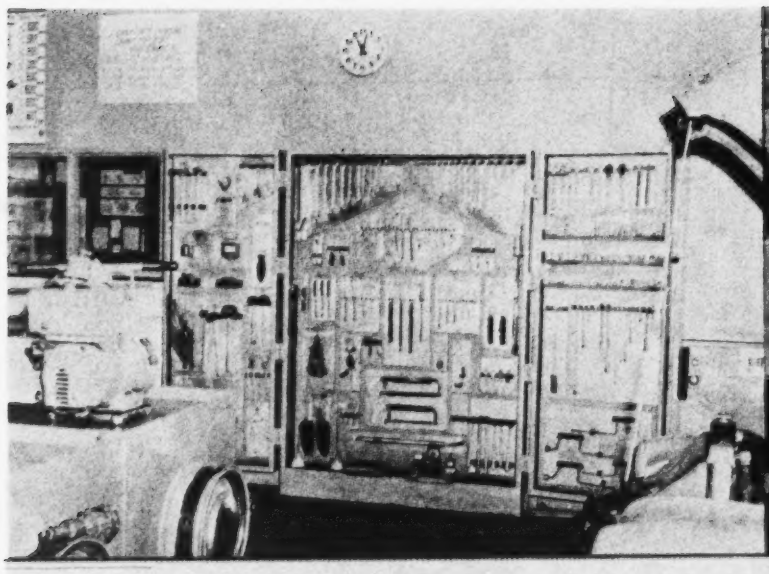
Pacific Union College

Pacific Union College was established at its present site at Angwin in 1909. The college is a private liberal arts school but it has always offered work in a number of professional fields including elementary and secondary teacher education. One rather unique aspect of the general requirements for graduation is that each student must complete a minimum of six quarter hours within the Division

Electricity-radio (electronics) courses assist students in obtaining amateur radio licenses.

Uses of automatic equipment are a part of the graphic arts educational experiences.





Orderliness of an industrial arts shop reflects good teacher-student management.

Introductory courses in electricity help develop an interest in the field of electronics.

of Applied Arts and Science. The departments comprising this division are Industrial Education, Home Economics, and Agriculture.

The Department of Industrial Education was reorganized in 1945 and began offering a major leading to the Bachelor of Science degree with concentration in construction, mechanics, or printing. In June, 1951, the California State Department of Education accredited the teacher education programs leading to special secondary credentials in Industrial Arts, Homemaking, and Music along with the General Secondary and General Elementary credentials.

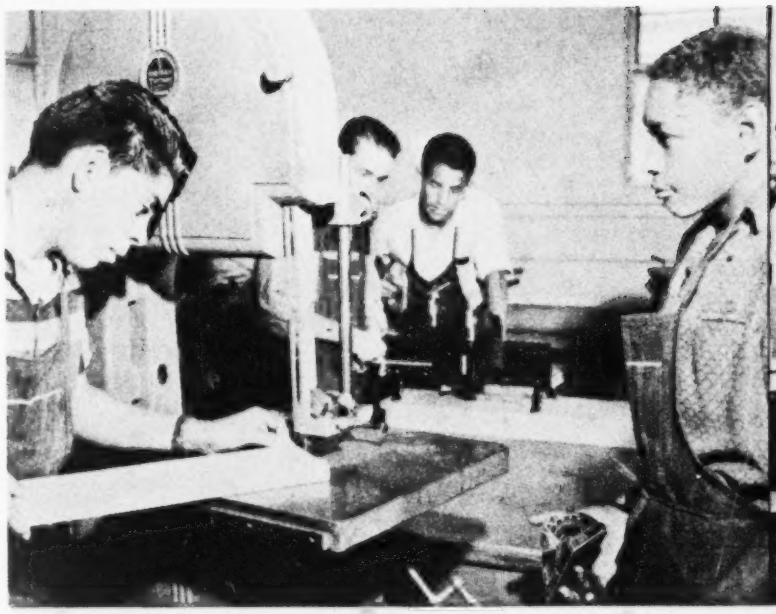
Since 1952, the Department of Industrial Education at Pacific Union College has provided industrial arts offerings to meet the general graduation requirement, a teacher education program leading to the Special Secondary Credential in Industrial Arts, and technical education in the areas of electricity and electronics, mechanics, construction, and graphic arts. Richard E. Fisher heads the staff consisting of six instructors. The first section of the new Industrial Education Building was completed in 1958.

San Diego State College

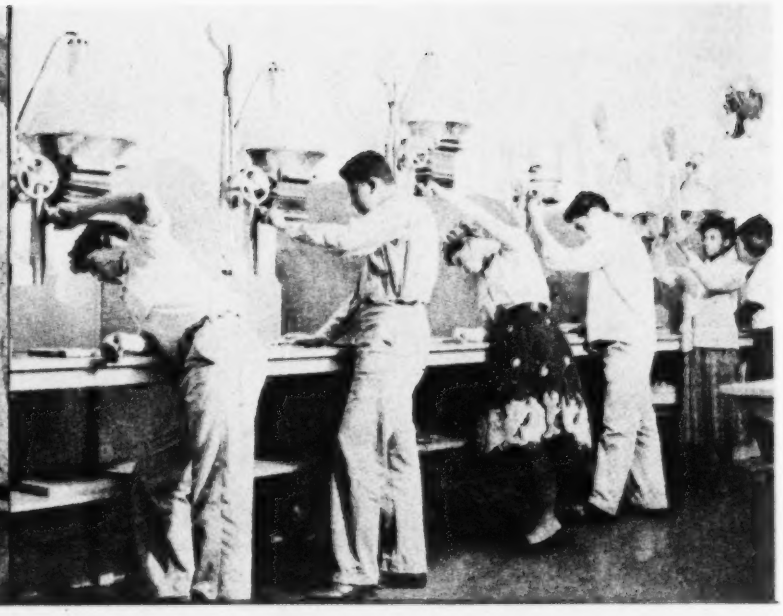
San Diego State College, formerly San Diego Normal School, first offered manual training in 1902. The activities included paper work, cord and cardboard work, basket weaving, bent iron work, bead work, wood carving, clay modeling, and simple furniture building. The courses offered were typical of the work in this era of education. In 1905, drawing, design, and mechanical drawing were added as activities. In 1916 courses in handicrafts and farm mechanics appeared.

Courses in printing and practice teaching were added in 1919. In 1921 courses offering work in concrete, sheetmetal, art metal, leather, electricity, internal combustion engines, patternmaking, foundry, pottery, and bookbinding were added to the curriculum. This complete industrial arts curriculum for teacher education purposes continued until the economic depression of the 1930's, when the administration discontinued shop work for budgetary reasons.

Industrial arts did not appear again at San Diego State College until 1947, when William MacQuarrie offered several courses. He was succeeded by Lawrence Luce in 1949. In 1950 Kenneth Phillips was made Chairman of the Industrial Arts Department. In January of 1953, the department moved into the present new building. Supervisors responsible for industrial arts education in the school districts in Southern California were appointed to serve on an advisory committee to assist this teacher preparation program. The Industrial Arts Department was accredited by the California State Department of Education in 1954. New equipment, courses, and staff have been con-



A general wood course provides experiences involving a variety of tools, materials, and processes.



Industrial techniques and applications as well as avocational values are emphasized in photography classes.

stantly added. Plans for an additional industrial arts building are now in preparation.

San Francisco State College

San Francisco State College traces its beginning to a Normal School established in 1875 by the city administration at the Girls' High School. In July, 1899, the Normal School became a state school and was moved to a new site. A short time after the school building was destroyed by fire in 1906, a new building was constructed at another location, which was used until the college moved in 1953 to its present campus. The school's name was changed to San Francisco State Teachers College in 1921. The present name was adopted in 1935.

During the 25-year period from 1922 to 1947, the college provided courses under the titles of Manual Arts, Manual Training, and Industrial and Mechanical Arts. In 1947, with the establishment of a Division of Creative Arts, a minor in industrial arts was offered to those preparing to become teachers. A program with a major in industrial arts was provided in 1951. Temporary buildings served to house the Industrial Arts Department until the department moved to its present facilities in the Arts and Industries Building.

The Industrial Arts Department was accredited by the State Department of Education in June of 1954. In the same year, courses were offered leading to a Master's Degree in Industrial Arts Education. Dwight W. Nichols heads a staff of four instructors. An addition to the Arts and Industries Building now under construction will provide the necessary facilities for the expanding industrial arts program.

San Jose State College

San Jose State College, originally San Jose Normal School, informally introduced manual training in the early 1870's. Charles H. Allen, principal of the old San Jose Normal School and a cutler by trade, gave instruction to certain students soon after his arrival in 1873. In 1887 a room was fitted up with a few hand tools.

Later, upon recommendation of Allen, a skilled carpenter was hired to give instruction. In 1890 James E. Addicott, a graduate of San Jose Normal School, entered a training program under the guidance of Calvin M. Woodward at the St. Louis Manual Training School. Upon completion of his work in St. Louis, Addicott returned to San Jose Normal School and established the first regularly organized program of industrial training. He remained in this position until 1901.

In 1902 Edwin C. Snyder came to San Jose from the Alameda School to become head of the

Manual Arts Department of the Normal School. Under his leadership and that of his successor, Andrew Hill, the work of the department grew and progressed. The first "special diploma" for teaching manual training was awarded in June, 1912.

In 1913 Benjamin Spaulding became head of the department and was responsible for the growth of the department from a two-year to a three-year to a four-year degree course; also for the present building constructed 33 years ago. Spaulding retired in July of 1956.

The Industrial Arts Department was accredited by the California State Department of Education in April, 1925. In 1929 Heber A. Sotzin became head of the Department. At this time the college enrollment was approximately 1,500 and the industrial arts staff consisted of three full-time instructors. Since that time the college student body has grown to approximately 11,000 and the industrial arts staff has increased to 18 instructors and two technical assistants. Courses and programs leading to a Master of Arts Degree and a General Secondary Credential are offered. Plans are under way for a new building which will adequately serve the needs of this Department.

University of California, Santa Barbara College

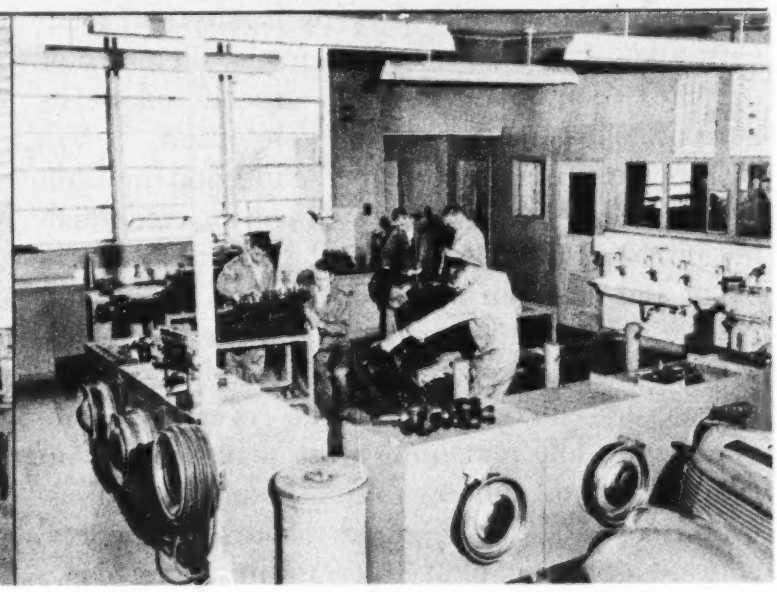
The Los Angeles State Normal School, which became the southern branch of the University of California in 1919, provided a program of manual training as early as 1911. As the University continued the program the name was changed to "Mechanic Arts" and then to "Industrial Arts." Shortly after Santa Barbara College became a part of the University of California in 1944, the University decided to center all industrial arts teacher education on the Santa Barbara campus.

University of California, Santa Barbara College, had its inception in 1891 with the opening of a cooking school for girls by Anna S. C. Blake. Ednah Rich was then sent to study sloyd under Gustaf Larsson with the idea that a practical course would be offered for boys. Upon her return Miss Rich was made principal of the Anna S. C. Blake Training School and supervisor of manual arts for the Santa Barbara Public Schools. Teachers and administrators throughout the state visited the school to observe its work. In order to meet the needs for trained teachers in this field, a six-week summer course was offered to experienced teachers as well as to normal school and university graduates.

In 1907 Mary H. Tracy, a graduate of the Boston Sloyd Training School, was added to the staff. The state legislature on March 27, 1909 passed a bill establishing the state normal school in Santa Barbara, which became the first normal school in the United States devoted exclusively to manual arts and home economics. Frank H. Ball

Industrial arts auto mechanics courses provide a variety of experiences.

A well-planned auto shop includes an area for engine overhaul.



succeeded Ednah Rich Morse as president of the Santa Barbara Normal School in 1916.

In 1919 the state legislature passed a bill changing the status of the school by dropping the name "Manual Arts" and "Home Economics." The Normal School became a four-year state teachers college in 1921. The Industrial Arts Department of Santa Barbara State College in January of 1923 became the first such department to be accredited by the State Department of Education.

Emanuel E. Ericson came to Santa Barbara College in 1925 and served as chairman of the Industrial Arts Department until 1948. During these 23 years Ericson became a nationally recognized authority in the field of industrial arts, was instrumental in the planning and construction of a modern industrial arts building at Santa Barbara, and witnessed his college become in 1944 a part of the University of California. Lynne C. Monroe was appointed department chairman in 1948 and was succeeded in this position by Kermit A. Seefeld in 1953. University of California, Santa Barbara College, moved to its new campus in Goleta in 1950. The new and modern industrial arts building on this campus was completed and put into use during the 1958-1959 school year.

INDUSTRIAL ARTS TEACHER EDUCATION AND CREDENTIALING

Success of the industrial arts program in the public schools of California reflects, in part, the quality of the industrial arts teacher preparation program in the institutions of higher learning in the state. Both past and present teacher educators have done commendable work in making this program outstanding.

In part, the success of industrial arts teacher education in California has resulted from the close co-operation among the departments of industrial arts in teacher education institutions in the state and between California supervisors of industrial arts and industrial arts teacher educators.

The dominant objective of industrial arts teacher education is the preparation of qualified teachers for the elementary and secondary schools. Research is a second objective assumed by the teacher educators. Research studies done by faculty and graduate students has added much to the literature of the profession. Industrial arts teacher educators have provided leadership to the profession.

Nine institutions of higher education in California, which have been accredited for credentialing by the State Department of Education, offer a major and minor in industrial arts. All institutions require 40 units of industrial arts for the major. Five or six areas (drawing, wood, metal, electricity, graphic arts, and auto) must be covered as a requirement. The remaining work may be taken in areas of greatest interest to the student. All industrial arts majors are required to pursue a general education program of at least 45 units. Professional courses in education, usually about 23 units, are taken to prepare the student as a teacher. In meeting the requirements of the colleges, students will also be meeting the requirements for the state credential.

Twenty units of industrial arts are required for a minor. Each institution has the privilege of indicating what units shall be taken. Some institutions permit different patterns within the 20 unit requirement. Many junior colleges in the state now offer courses in industrial arts which are accepted as college transfer work.

Most of the industrial arts teacher preparation institutions in California offer a master's degree in industrial arts or one in education that requires special study in the field of industrial arts.

Any qualified person wishing to teach industrial arts in California may secure a credential by direct application to the Commission of Credentials, Sacramento, or may be recommended for a credential by one of the accredited institutions listed below. Information concerning specific requirements for industrial arts teaching credentials appears in California Administrative Code, Title 5, Education, Chapter 1, Subchapter 2, or may be obtained by writing to the Commission of Credentials, Sacramento.

The names and addresses of institutions of higher education in California with departments of industrial arts accredited for credentialing purposes follow:

Chico State College
Chico, California

Fresno State College
5421 North Maple
Fresno 26, California

Long Beach State College
6101 East Seventh Street
Long Beach 15, California

Los Angeles State College of
Applied Arts and Sciences
5151 Murphy Avenue
Los Angeles 46, California

Pacific Union College
Angwin, California

San Diego State College
5402 College Avenue
San Diego 15, California

San Francisco State College
1600 Holloway Avenue
San Francisco 27, California

San Jose State College
250 South Fourth Street
San Jose 14, California

University of California
Santa Barbara College
Goleta, California

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